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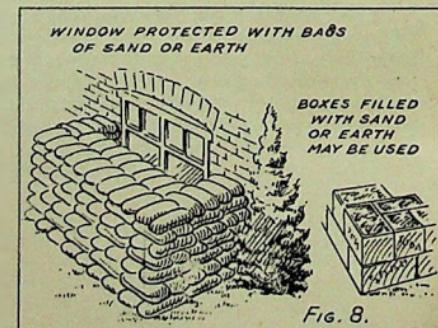
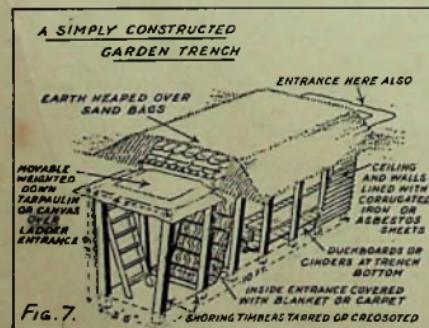
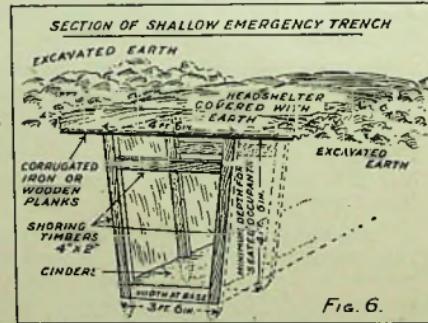
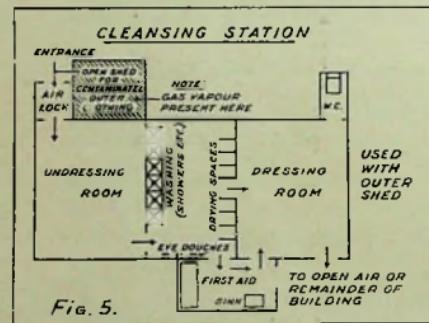
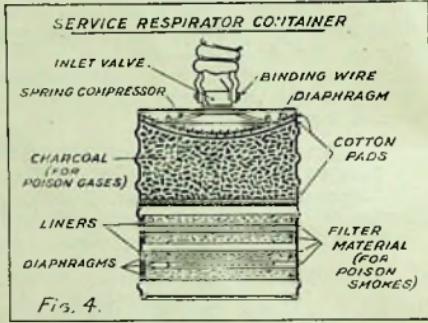
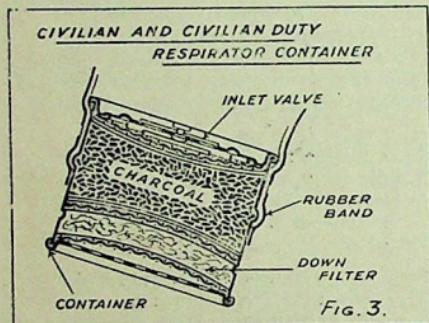
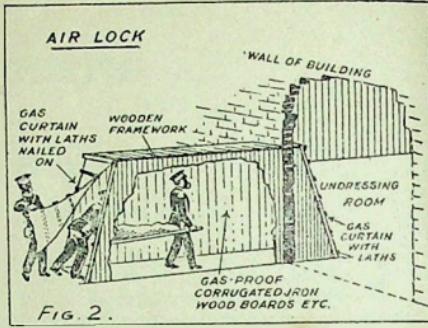
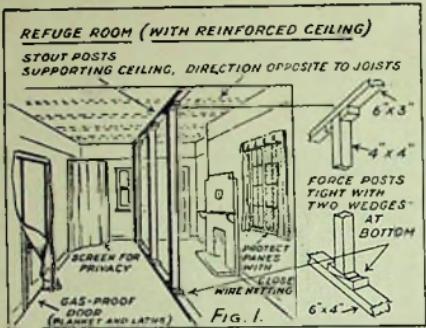
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METHODS OF ATTACK BY AIRCRAFT

There are three methods which an enemy operating from a distance with high-powered, speedy bombing aeroplanes might use to terrorise our civilian population and disorganise our national services :

1. **High Explosive Attacks**, involving the use of highly destructive bombs to cause destruction, injury and loss of life

2. **Incendiary Attacks**, i.e., the use of fire bombs to cause widespread fires so as to create panic and disorganise essential services, especially the A.R.P. Organisation.

3. **Gas Attacks**, involving the release, from bombs or as spray, of dangerous liquid gases, vapour gases, or poisonous smokes, intended to injure or incapacitate the public, to nullify or hamper precautions taken against (1) and (2), and to make difficult the work of rescue and first aid.

Aeroplanes flying at low altitudes may also be employed to fire from *machine guns* at crowds of civilians or at masses of soldiers. This method is not likely to be used, however, so long as our people are well protected by our own aircraft and our anti-aircraft batteries, because of the danger to which the attacking force is itself subjected.

During an air attack death or injury may also be caused by falling shrapnel and bullets from our own anti-aircraft guns.

HIGH EXPLOSIVE ATTACKS

The main weapon likely to be used by enemy aircraft to injure and terrorise our civilian population is the **high explosive bomb**.

This contains chemicals which, when ignited or detonated (e.g., by explosion of a detonator on impact of the bomb with a hard surface) instantaneously and violently interact to create a great volume of gas. The enormous pressure inside the metal shell causes a most destructive explosion and creates a terrific wind blast all around the point of impact. T.N.T. (Trinitrotoluene), the most powerful explosive yet discovered, **expands into about 4,000 times its original volume**, and, of course, the heat of explosion itself causes still further great and rapid expansion of the gases produced.

The damage caused by H.E. bombs may result from :—

1. **Direct Hit.** A 500 lb. bomb striking a hard surface will smash up practically everything within a radius of about 50 feet of its point of impact.

2. **Wind Blast.** The tremendous expansive force of the explosion drives forward the air all around it with enormous speed and force, so that the resultant blast can create injury, shock, collapse of buildings and destruction over a wide area. Within 50 feet of a large bomb its wind blast will tear a man to pieces and will shatter a solid brick wall. Further away, the blast will deafen people by bursting their ear drums, and may kill them by paralysing their lungs. Windows and doors will be blown in over a wide radius, and the blast so entering

will (as well as the "suction" effect which follows) wreck floors and ceilings and cause the sides of the building to collapse.

3. Splinters. The force of the explosion drives in all directions with terrific and injurious force, bits of the metal casing of the bomb, as well as stones, bricks, iron work, pieces of paving, etc. Splinters from a medium size bomb will penetrate through a 9-inch brick wall at a distance of 50 feet from the point of impact.

4. Earth Vibration. The shock of the explosion causes ground vibrations or impulses (like those of an earthquake) which weaken the foundations of buildings and fracture mains and sewers.

Types of H.E. Bomb.

There are many kinds of H.E. bombs in existence, ranging in weight from a few pounds to $2\frac{1}{2}$ tons. Bombs of the so-called "percussion" type are designed to explode **immediately** on impact with the ground or buildings, spreading death-dealing splinters and débris in all directions over a wide area, and causing death, injury and destruction to buildings by the effect of their terrific wind-blast.

As a percussion bomb explodes on contact, it makes a relatively small crater.

Other bombs, of the "armour-piercing" or "penetrative" type, with delayed action fuses, are intended to penetrate deeply and explode beneath streets in subways, underground railways or tunnels, and in the foundations of great buildings, with devastating effect not only on such structures and works, but also on essential services such as sewers, water, electricity, gas and telephones.

The blast and splinter effects of a delayed-action bomb are more restricted than those of a percussion bomb because the bomb penetrates more deeply into the earth or through buildings before it explodes. The large crater made by such a bomb acts like a funnel, the sides of which prevent the spreading of blast and splinters and cause them to go upwards rather than sideways. The explosion of such a bomb can create real havoc by setting up severe earth movements or vibrations, and in consequence an objective *may* be destroyed even though a direct hit is not registered.

The damage caused by an H.E. bomb naturally depends on the type of surface on which it falls as well as on the nature and extent of any buildings on that surface. The bomb penetrates more deeply into loose soil or sand than into concrete or hard gravel, or hard macadam. Densely built-up areas suffer more than areas with few buildings. Stone buildings suffer less than buildings of brick; steel frame buildings (because of their "give" or resilience) suffer less damage than buildings of solid, more rigid type.

The size of bombs used in an attack will depend partly on the size and efficiency of the aircraft, but mainly on the nature of the enemy's objective.

In general, large delayed-action bombs (500 lbs. to 1,000 lbs. weight) will be used when the enemy wishes to concentrate the damage (e.g., against some specific object such as a large munition works, railway junction, power station, shipyard or large communal shelter), whilst small percussion bombs (of about 60 lbs. weight) will be used if the object is to spread the danger over a wide area and so cause panic and disorganisation.

INCENDIARY ATTACKS

The typical incendiary bomb consists of a thick-walled tube of magnesium metal, filled with an igniting compound. On striking a hard surface the compound ignites and burns fiercely for a minute or two, by which time the metal casing is well alight. There is no explosion, but such a bomb when dropped from a height will penetrate an average roof and come to rest on the floor immediately below, through which it will quickly burn if the floor is not specially protected.

Incendiary bombs may be of any weight from 2 lbs. to about 60 lbs., but the smaller type, weighing about 2½ lbs., and known as the "Kilo" bomb, is the most likely to be used because one aeroplane can carry as many as 2,000 bombs of this type, and so create widespread havoc.

The great danger of an incendiary bomb is that it is almost impossible to put it out by ordinary means. A small jet of water and most forms of extinguisher are quite useless. Indeed, they may actually increase the danger by scattering the burning magnesium. Further, the great heat generated by an incendiary bomb will not only set fire to floors and any surrounding inflammable materials, such as furniture and carpets, but will also cause the bomb to penetrate corrugated iron and thin iron plates.

To enable our fire-fighting services to cope efficiently with incendiary attacks, their strength and equipment have been greatly augmented, but even so they are not likely to be adequate unless *every householder* avails himself of the knowledge and simple appliances (explained on page 20) by which an incendiary bomb can be controlled without difficulty.

WHAT WE MUST KNOW ABOUT GAS ATTACKS

The Objects of a Gas Attack are:

1. To CAUSE MANY CASUALTIES through injury or incapacity.
2. To DISORGANISE INDUSTRY AND ESSENTIAL SERVICES, and especially to hinder the repair of damage, and the work of rescue and first aid, necessary after high explosive attacks. It is extremely likely that an enemy attacking this country would use high explosives and gas together.
3. To SHATTER THE MORALE OF or TERRORISE the people.

To Minimise the Dangers of Gas Attack we must understand:

1. THE METHODS OF GAS ATTACK, so that we shall know what to expect.
2. THE TYPES OF GAS LIKELY TO BE USED, so that we can at once recognise the gas used in an attack, take the steps necessary to protect ourselves against its likely injurious effects, and apply the right treatment to casualties.
3. THE CONDITIONS FAVOURABLE TO A GAS ATTACK, so that we may know when the danger is greatest, i.e., when to expect an enemy air raid; or, if a raid is in progress, whether weather conditions will increase or decrease the danger.
4. THE METHODS OF PROTECTION AND FIRST AID, so that we can take the *correct* steps to minimise injury.

The success of a gas attack, from the attacker's point of view, depends very largely on conditions and forces over which he has no control. In fact, an attack with even the most dangerous gases can be rendered almost harmless by: (a) weather conditions; (b) education of the public in the use and effectiveness of protective measures; and (c) an efficient system of Air Raid Warnings.

METHODS OF GAS ATTACK BY AIRCRAFT

Gas Bombs.

Gas attacks usually involve the release of gas bombs, of small or large size, made of a thin steel shell containing dangerous gas,¹ or poison smoke, which is released immediately the bomb strikes the ground. As the shell quickly bursts, the bomb **does not penetrate deeply** into the ground and the gas is scattered over a wide area. In other words, there is only a **small crater and a feeble explosion**.

The extent of the resultant damage depends on (a) the size of the bomb; (b) the nature of the surface bombed—the harder the surface, the wider the area splashed or contaminated² by a gas bomb; (c) the type of gas used; and (d) the prevailing atmospheric conditions.

Gas Spray.

Dangerous liquid gas may be released in small droplets like rain over a wide area. The particles, which may be "fine" or "gross", i.e., small or large, fall on the exposed parts of the body—face, neck and hands—without being noticed, and ultimately give rise to nasty blisters and burns. Gas spray attacks are not likely because the attacking planes have to fly low (and so risk being brought down) if an effective concentration of gas is to reach the ground. Moreover, such an attack is **ineffective if people keep under cover**, as the droplets are soon rendered harmless by weathering.

¹ **Gas.**—This term in warfare means any chemical substance—solid, liquid or gas—used to cause poisonous or irritant effects on the human body.

² **Contamination.**—Presence of dangerous war gas on the body, clothing, food, materials, buildings or anything else.

TYPES OF GAS LIKELY TO BE USED

The gases used in war may be (a) **True Gases**, or (b) **Liquids**, which evaporate and give off dangerous vapour, or (c) **Poisonous Smokes**.

The true gases and poison smokes cause injury only when they are breathed by unprotected persons, but some of the liquid gases involve a twofold danger, viz. : (1) **danger from contact with the liquid itself** (frozen or unfrozen), and (2) **danger from exposure to vapour given off by the liquid**.

Because of their greater permanency or "lastingness", these slowly-vaporising, liquid gases are described as **Persistent**, in contradistinction to the description **Non-Persistent** applied to the more evanescent true gases and poison smokes.

Non-Persistent (N.P.) Gases.

These, when released, form a cloud (not necessarily visible) which **readily evaporates or mixes with the surrounding air, gradually becoming dispersed by the wind, rain, and rising air currents until the cloud or concentration of gas is too weak to cause injury.**

These gases leave no liquid contamination on the ground, and as their period of effectiveness lasts only a few minutes, surprise is essential for their effective use by an attacker. Examples are **Chlorine** and **Phosgene**.

Persistent (P.) Gases.

These—the most dangerous of war gases—are thick, oily liquids, which form a large splash at the point of release or explosion whence they evaporate slowly. They will last or "persist" for many hours, and will give off harmful vapours until destroyed or rendered harmless by processes known as "**decontamination**"¹ or "**neutralisation**". Examples are **Mustard Gas** and **Lewisite**.

The division of gases into these two groups is important as a guide to what we must do when attacked by a gas. If the gas is **non-persistent**, we can leave the wind and rain to disperse it quickly. But if the gas is **persistent**, we must take steps to neutralise or destroy it, or it will continue to be a source of danger until weathered.

Non-persistent gases last for **minutes**; semi-persistent gases for **hours**; persistent gases may last for **days or weeks**.

GASES CLASSIFIED ACCORDING TO INJURY PRODUCED

Gases may also be classified, according to the injury they produce, as :

1. **Tear Gases** (or "Lachrymators").
2. **Nose Irritant Gases** ("Sternutators" or "Sneezing" Gases).
3. **Lung Irritant Gases** ("Choking" Gases).
4. **Blister Gases** ("Vesicants").

¹ **Decontamination**—A process intended to remove the contaminating gas from materials and to render it harmless.

TEAR GASES

Even in small quantities the three Tear Gases [known as (a) C.A.P., (b) K.S.K., and (c) B.B.C.¹] immediately cause intense smarting and irritation of the eyes, inducing a profuse flow of tears which prevents the victim from seeing and carrying on his normal work.

Tear gases do not usually affect the throat or lungs, and rarely cause lasting or serious damage: the effects on the eyes continue only during exposure to one of the gases and pass off quickly in the pure air. Tear gases are essentially "panic" or "incapacitating" or "harassing" gases.

C.A.P. (Non-Persistent).

This is a white or grey crystalline solid (with an indefinite smell) which, when heated, gives off an intensely tear-producing vapour. In dense concentrations² the vapour is a skin irritant, but when diluted by the air it is harmless. It does not affect the throat or lungs. As its effects on the eyes and skin soon pass off, it is much used for anti-gas training.

K.S.K. (Persistent).

This when impure is a dark-brown, oily liquid with a smell similar to pear drops. It evaporates slowly at ordinary temperatures, and is a strong tear-producing agent, though not so rapid and violent as C.A.P. In dense concentrations it irritates the upper breathing passages as well as the eyes. Contact with the liquid causes slight blisters and burns. Like C.A.P., K.S.K. does not, as a rule, cause permanent injury.

B.B.C. (Very Persistent).

This yellowish-brown, oily liquid has a very pungent bitter-sweet smell like bitter almonds or almond essence. It is the least powerful but most persistent of the tear gases, and will remain effective for several hours if not destroyed. In high concentrations, the vapour damages the lungs, while the liquid will burn and blister the skin and may permanently injure the eyes.

NOSE IRRITANT GASES: POISON SMOKES

The three nose irritants (known as D.A., D.M., and D.C.)³ are all arsenical compounds, which are usually released as non-persistent, arsenical smokes or clouds of tiny solid particles from some form of bomb-generator and remain suspended in the air until dispersed by wind and rising air currents.

Persons who inhale even small quantities of these smokes experience, after a short delay, intense irritation of the nose, throat and breathing passages, followed by pains in the head, gums and teeth, sneezing and giddiness. Prolonged exposure results in irritation of

¹ Chemical names: C.A.P. = Chlor-aceto-phenone; K.S.K. = Ethyl-iodo-acetate; B.B.C. = Bromo-benzyl-cyanide.

² Concentration—The proportion of gas in a given volume of air.

³ Chemical names: D.A. = Di-phenyl-chlor-arsine; D.M. = Di-phenyl-amine-chlor-arsine; D.C. = Di-phenyl-cyano-arsine.

the eyes, pain and tightness in the chest, much spitting, pain in the stomach and perhaps some vomiting.

Although the effects of nose irritants are very alarming and may cause misery and depression, **they do not cause permanent injury and gradually pass off in pure air.**

The worst feature of nose irritants is that, even after protection is obtained by means of a **Respirator¹** or **Gas Mask** or by removal to a pure atmosphere, the **symptoms for a time increase in intensity**, so that persons affected lose confidence in their respirators and are tempted to take them off. Casualties must, therefore, be made to realise that this increase in symptoms is one of the characteristics of nose irritants and that **respirators must be kept on until the danger has passed.**

Arsenical smokes will poison water, milk, food, etc.

LUNG IRRITANTS: "CHOKING" GASES

The principal lung irritant gases are:

- | | | |
|-------------|----------------|----------------------------------|
| 1. Phosgene | Non-persistent | 3. Di-Phosgene—Semi-persistent. |
| 2. Chlorine | (true gases). | 4. Chloropicrin—Semi-persistent. |

All these gases are **definitely lethal** and, if breathed in quantity, will cause grave and perhaps fatal injury to the breathing passages and lungs.

Lung irritants burn or inflame the smaller bronchial tubes and air spaces of the lungs. The lung substances become suffused with blood and inflammatory fluid, so that there is much **congestion and interference with the passage of oxygen into the blood**, causing heart strain, collapse and frequently death through asphyxia.

Phosgene.

This most dangerous of the lung irritants is a non-persistent gas with a smell like **musty hay or rotting vegetation**. Except that a **thin whitish vapour is seen for a few seconds at the point of release**, Phosgene is invisible. It corrodes metals but is **destroyed quickly by water.**

The immediate effects of breathing Phosgene are coughing, choking and a feeling of suffocation, shallow, rapid breathing, and smarting and watering of the eyes. After a short time these effects pass off, and a period of apparent "**well-being**" follows, during which the victim feels quite capable of carrying out his normal duties.

This period of apparent "**well-being**" constitutes the chief danger of Phosgene, because **after some hours all the original symptoms return in a much more severe form.** The patient is then in a critical condition and, if not medically treated, will probably die.

¹ A breathing apparatus designed to protect the eyes and lungs from dangerous gas by eliminating the gas from inhaled air.

Chlorine.

This gas is easily recognised by its unpleasant, suffocating smell (of chloride of lime), and also by its appearance on release as a faint greenish cloud, especially in a damp atmosphere.

Chlorine is a very powerful lung irritant like Phosgene, but it is not so deadly, more especially as there is no dangerous "period of delay" before the onset of serious symptoms.

Chlorine corrodes metals and rots clothes. It dissolves in water.

Di-Phosgene.

This is a colourless *liquid* smelling somewhat like Phosgene and having the same effects. It vaporises slowly and is semi-persistent.

Chloropicrin.

Chloropicrin is a yellow, oily *liquid*, which vaporises slowly and is semi-persistent. Its smell and effects are similar to those of Chlorine, but it also causes tears. Though the most irritant of the lung gases, it is less lethal than Phosgene.

THE BLISTER GASES

The two blister gases, **Mustard Gas** (known to the French as "Yperite" and to the Germans as "Yellow Cross") and **Lewisite** (the American "Dew of Death"), are the most important of all war gases and the ones most likely to be used in air warfare.

Both gases are *liquids* which vaporise slowly and remain effective for long periods. In the liquid and the vapour form, they not only cause severe injury to the unprotected eyes, nose and throat, but also cause dangerous burns and blisters on contact with the skin either directly or by quickly soaking through the clothing, whilst the vapour, if breathed, may seriously injure the lungs.

Hence, the Respirator which protects the face and breathing passages but not the head and body is not a complete protection against blister gases.

The blister gases are dangerous not in the sense that they are very deadly (which they are not), but because their "universal action" on the body and their great powers of penetration render protection difficult and may force many casualties to leave their work to get hospital treatment.

Mustard Gas.

In the impure form likely to be encountered, Mustard Gas is a **brown, oily liquid**. On grass or trees it may be invisible. On dry surfaces (e.g., roads) it appears as a brownish stain, but on wet surfaces it is slightly iridescent. Its smell is indefinite, and is likened by different people to that of onions, garlic, horse-radish, or fresh domestic mustard powder. Mustard Gas in its liquid, frozen or vapour state will dangerously injure the human body.

¹ Di-chloro-di-ethyl-sulphide. When pure, B.P. = 423° F; F.P. = 45° F.

Persistence and Penetrative Power. Mustard Gas has great persistency, as it evaporates very slowly at ordinary temperatures. Hence, if it is not dealt with and destroyed as soon as it is discovered, it may remain **active and dangerous for long periods**. Its penetrative powers are so great that it will pass through wooden buildings and an 18-inch ordinary brick wall, and only a very limited number of materials (e.g., glass, metal and good-quality glazed tiles) completely resist it. Both the liquid and vapour **quickly penetrate ordinary clothing and leather**, and will seriously injure the skin of the wearer and of anyone who touches the contaminated material.

Once liquid Mustard Gas has penetrated a substance (clothing, wood, bricks, stone, tar, etc.) it continues to give off dangerous vapour until it has evaporated or is destroyed.

Solubility. Mustard Gas is only very slightly soluble in cold water, but boiling water destroys it rapidly, forming hydrochloric acid. It is readily soluble in oils, benzene, methylated and other spirits, tar and fat. It is, therefore, **quickly absorbed into the fatty parts of the body** and into the tarred surfaces of roads, with dangerous results.

Stability. Mustard Gas is very stable and can be destroyed only by boiling in water or by burning or by chemical means. Chlorine attacks it violently.

Liquid Mustard Gas, though practically insoluble in water, is **slowly "hydrolysed"**¹ and made harmless. If it falls into a reservoir, it will sink to the bottom and remain there until it is gradually destroyed.

Insidiousness ("Treachery"). Mustard Gas is insidious or treacherous for two reasons. First, it can be detected only in the vapour form by the sense of smell, but **since its smell is faint it is not easily distinguishable**: it smells differently to different people and the smell is so easily confused with other smells that certain and immediate recognition is difficult. After exposure for a period, too, the **sense of smell becomes dulled**, so persons may continue to be exposed to the gas without being aware of its presence.

Secondly, the gas, whether solid, liquid or vapour, causes **no immediate irritation** or other sensation on the skin, though the eyes are at once affected by liquid mustard. **Damage to the skin appears some hours after contact**, so that a person may be quite unaware that he is contaminated until the injury makes its appearance and it is too late to take preventive steps.

Cumulative Action. Prolonged exposure to a weak concentration of Mustard Gas produces the same effect as short exposure to a strong concentration.

Contamination by Mustard Gas VAPOUR.

Exposure to Mustard Gas vapour does not result in immediate injury, even to the eyes, but, **after some time**, severe damage appears in the eyes, the respiratory tract, the skin and the stomach.

¹ **Hydrolysis.**—The action of water in changing the chemical composition of a gas so as to render it harmless.

EYES. The eyes, being very sensitive and delicate, are the first to show signs of injury and, after a few hours, the first effects are irritation and smarting, followed after an hour or two by profuse tears, pain, headache and swelling of the eyelids. Later there is increased pain, particularly if there is exposure to a strong light, and considerable discharge, until, after 18 hours, the eyes become completely closed. Although actual loss of sight from vapour contamination is very rare, the period of injury lasts from two to six weeks.

RESPIRATORY TRACT. There are no immediate effects, but after a while there is irritation in the nose and upper breathing passages, running from the nose, sneezing and coughing. If the voice box is affected, there may be partial or complete loss of voice and a dry, ringing cough. If the effects extend to the windpipe, the cough will become loose and there will be a good deal of expectoration and pain behind the breast bone. Cases that have suffered long exposure develop bronchitis, which clears up in about six weeks, but in worse cases broncho-pneumonia may set in, often with fatal results.

SKIN. Damage to the skin appears after a delay of some hours, with most severe effects on the fatty parts of the body and such surfaces as the neck, shoulders, knees, ankles and wrists where friction occurs. Moist parts, e.g., the armpits and crutch, which are subject to perspiration, are also severely affected.

The signs of injury are, first, an itching after about four hours, and then, after eight hours, a reddening of the skin, which gradually deepens until it has the appearance of scalding. In mild cases, the injury rarely develops beyond the redness, but in more severe cases very tiny blisters appear, and gradually join together until they form large blistered patches which become septically dangerous unless properly treated. Although there is no systemic disturbance and usually no pain, the itching of the affected part may cause loss of sleep.

STOMACH AND BOWELS. The swallowing of saliva contaminated by Mustard Gas vapour causes pain, nausea and possibly vomiting, but serious results seldom develop and the effects soon pass off.

LIQUID Mustard Gas Contamination.

SKIN. Unless steps are taken immediately to neutralise any liquid Mustard Gas that gets on the skin, very severe burns and blistering make their appearance.

After a short period there is itching, followed after about two hours by redness at the place of contact, in the centre of which (after from 12-24 hours) a blister begins to form. This gradually increases in size, until there is a large, tensely-filled, irregular-shaped blister.

A spot of liquid Mustard Gas the size of a pin's head will eventually produce a very slow-healing blister about the size of a halfpenny, of which the largest part is under the skin. Similar results will be produced even on the clothed parts of the body unless the contaminated clothing is removed at once.

EYES. Liquid Mustard Gas in the eye is probably the worst type of contamination because lasting injury, probably blindness, can be caused by the smallest drop. **Irritation is felt immediately on contact**, but the effect passes off until about an hour later when the eye becomes painful and swollen, and finally closes completely.

MOUTH AND STOMACH. Both may be seriously damaged by swallowing contaminated food or drink.

Lewisite.¹

Lewisite in its pure state is a **colourless, odourless, heavy, oily liquid** like glycerine, but in the impure state used for gas attacks it is dark brown in colour and has a **pungent smell of geraniums**.

Though Lewisite is less persistent and stable than Mustard Gas—mainly because **it is destroyed immediately by water or any alkali**—its penetrative power is, if anything, greater.

Lewisite is not affected by Chlorine, but is destroyed by the water in bleach paste.

Lewisite is less dangerously insidious than Mustard, not only because **it is immediately recognised by its characteristic smell, but also because its effects are noticed at once**. It is not, therefore, so likely to be used as Mustard.

Lewisite vapour produces **immediate irritation in the nose, eyes and throat, causing coughing, sneezing, running from the nose and eyes, and pain in the chest**, whilst long exposure causes severe skin irritation.

Liquid Lewisite is at once recognised if it touches the skin by a **characteristic tingling or stinging sensation** at the place of contact, where, after about twelve hours, there begin to form round, pearl-like blisters. These are more painful than Mustard Gas blisters, and are more **dangerous because they contain arsenic**, which may give rise to arsenic poisoning.

CONDITIONS FAVOURING A GAS ATTACK

As all war gases, including the vapours of liquid gases, are heavier than air, they **tend to remain near the ground when released**. They will, however, expand and rise with heat, and contract or fall when cooled, i.e., their density² falls as temperature rises.

Hence, if a liquid gas is released as liquid on a **warm day or sultry summer night**, the warmth will cause it to evaporate quickly and so increase the danger from the vapour, but the heat will tend to cause the vapour to rise and gradually disperse into the upper atmosphere.

¹ Chloro-vinyl-di-chlor-arsine. When pure, B.P. = 374° F.; F.P. = 8½° F.

² The weight of a given volume of gas as compared with the weight of an equal volume of pure, dry air. Some gases weigh seven times as much as air.

If, on the other hand, the ground temperature is sufficiently low to freeze a liquid gas, the gas will remain in its frozen state until the temperature rises sufficiently for it to thaw, and there will be continuous danger from contact with the frozen gas, as well as ultimate danger from the vapour given off when the thaw sets in.

Again, on calm frosty nights, when the ground temperature is relatively low and the cold air remains close to the ground, the dispersal of any of the heavy war gases will be delayed and the period of danger lengthened.

Wind conditions are very important. A strong wind will rapidly disperse non-persistent gas, carry liquid gas splashes over a wide area, and make a liquid vaporise more readily and more strongly.

To the gas raider, a wind velocity (or speed) of between 5 and 12 m.p.h. is the most favourable, being sufficient to spread the danger without causing serious loss of effectiveness through dispersal of the gas released. A velocity less than 5 m.p.h. will not ensure that the gas is spread over a wide area, while a velocity of over 12 m.p.h. will, in general, result in too rapid a dispersal, although, in densely built-up areas, such a wind may force the gas into confined spaces and shelters which otherwise would have been safe.

The effectiveness of gas as a war weapon is greater in densely built, wind-sheltered areas than in more open country or suburban areas; the more open the district the more rapid is the dispersal of the gas; whereas buildings and walls break the wind and slow down or prevent dispersal, the gas tending to hang about in areas, hollows, courtyards and other enclosed spaces.

In general, cold, moderately calm nights in winter are more favourable to gas attacks than warm still nights in summer, while the night is more favourable for gas attacks than the daytime, because ground temperatures are then lower and the rate of evaporation and of dispersal is consequently less.

A drifting fog or mist is favourable to gas attack, because the gas clings to the particles of moisture and disperses slowly. Gradually, however, the moist air decomposes or breaks up the gas and renders it harmless.

Light rain has little or no influence on the effectiveness of a gas. Heavy rain will not only clear the air of gas, but will also help to wash it away and render it harmless.

SUMMARY OF GAS ATTACK FACTORS.

Favourable.

Dull, misty or foggy weather.
Wind, 5-12 m.p.h.
Cold, clear, still night.
Dawn or dusk.
Little or no rain.
Built-up areas.

Unfavourable.

Bright, sunny weather.
Wind over 12 m.p.h.
Warm, breezy day or night.
Midday.
Heavy rain.
Open country.

IDENTIFICATION OF GASES

It is of vital importance that every member of the A.R.P. Services—and indeed every citizen—should be able at once to identify a gas used in an attack, so that the precautions particularly applicable to that gas can be taken. If a mistake is made in this identification, valuable A.R.P. services may be called out unnecessarily, and time may be lost that might have been applied in the saving of lives.

In general, identification is by **visible signs, smell and immediate irritant effects** on the body. In addition, Local Authorities will provide **Chemical Detectors**, treated with a special yellow detector paint, or fitted with yellow detector paper, which, on contact with liquid gas, is immediately turned red.

Chemical detectors are of two kinds:

1. **SPRAY DETECTOR**: 15-inch square boards painted yellow, placed in prominent positions on pavements, tops of buildings, the tops of pillar boxes, roofs, etc. The main object of these is at once to "spot" the use of liquid gas spray.
2. **GROUND DETECTOR**, to be used by special gas detection officers and decontamination squads where contamination cannot easily be seen, e.g., on grass. It consists of a **Detector Stick** with a semi-circular piece of wood attached, on which is fastened a piece of yellow-coloured detector paper taken from a roll.

As all three types of the liquid war gases will turn the detector paint red, other factors must be taken into account in fixing the identity of the gas, e.g., smell and tear-producing effects.

It is highly important, in using the detector stick, to **approach a bomb crater downwind** if that is possible, otherwise the user will be subjected to danger from vapour.

As non-persistent gases are very quickly dispersed, gas detection is chiefly of importance in the case of persistent gases, for as long as any blister gas liquid remains, both the liquid and its vapour will be a source of danger to anyone in the vicinity.

QUICK IDENTIFICATION OF FORM OF ATTACK AND TYPE OF GAS

1. VISIBLE SIGNS	2. SMELL	3. IRRITANT EFFECTS	4. CHEMICAL MEANS	DANGER INDICATED
A. Recognition of Type of Attack.				
Loud explosion and vivid flash at point of release; small flying splinters; large crater	—	—	—	High explosive
No explosion, but immediate fire	—	—	—	Incendiary bomb
Dull or feeble report with little or no flash; large fragments of bomb; small crater, and— 1. No liquid around crater 2. Liquid around crater	(Various—as below)	(Various—as below)	(As below)	Gas bomb
Fumes issuing from a crater in a stream	do.	do.	—	1. Non-persistent Gas 2. Liquid Gas
Droplets of liquid over a wide area	do.	Pain in nose, sneezing, burning in throat	Detector paint turns red	Presence of generator releasing Nose Irritant—D.A., D.M., D.C.
B. Recognition of Type of Gas.				
Greenish cloud at point of release	Chloride of Lime	Sudden catch at back of throat, coughing and choking	—	Chlorine
Whitish wisp of vapour	Musty Hay	do. plus tears	—	Phosgene
Yellow liquid around crater	Chloride of Lime	As for Chlorine	do.	Chloropicrin
Colourless liquid around crater	Musty Hay	As for Phosgene	do.	Diphosgene
None	Indefinite	Profuse tears	—	C.A.P.
Brownish cloud which gradually settles on ground. Wet patch on dry surface	Bromine or Bitter Almonds	Smarting of eyes, tears	do.	B.B.G.
Wet patch on dry surface	Pear Drops	do.	do.	K.S.K.
Wet patch on dry surface	Geraniums	Irritation of eyes and nose	do.	Lewisite
Brownish spot on body	do.	Tingling of the skin	do.	
Brownish cloud which gradually settles on ground to form a—	Onions, Garlic, Horse-radish, etc.	None except stinging of eyes	—	Mustard
Wet patch on a dry surface, or an iridescent patch on a wet surface	do.	—	do.	

METHODS OF PROTECTION AGAINST AIR ATTACK

Methods of safeguarding the civilian population against air attack may, conveniently, be considered under three headings, viz.:

1. Individual Personal Protection ;
2. Protection of Materials ; and
3. Administrative or Communal Protection.

INDIVIDUAL PERSONAL PROTECTION

High Explosive Bombs.

It should be clear, from what has been said, that the individual can do little to protect himself against the effects of a **direct hit** from a high explosive bomb. Absolute protection can be obtained only in expensive, reinforced concrete shelters and deep tunnels, matters which are generally within the power only of the Government or of Local Authorities or of concerns with large resources (see page 60).

Actually, the chance of a **direct hit** in the case of any particular individual is extremely small, and most of the injury and loss of life during high explosive air attacks is caused by the effects of falling shrapnel, explosive blast and flying steel splinters, by the collapse of buildings, and by shrapnel and bullets from anti-aircraft guns.

The explosion of a 500-lb. bomb (the most likely size) in a 40-ft. wide street will blast down the front of brick and stone houses for a distance of 70 feet on each side, whilst flying steel splinters may cause death or injury within a distance of 700 yards.

Full protection from the maximum splinter and blast effects of such a bomb exploding 50 feet away is afforded by 1½ inches of steel ; or 13½ inches of solid bricks in cement ; or 15½ inches of cavity bricks ; or 12 inches of reinforced concrete ; or 15 inches of ordinary concrete, or 2 ft. 6 in. of sand or earth.

At a greater distance from the point of explosion the protective material can be less thick. At 100 feet, for example, a 9-inch brick wall is sufficient protection.

As the blast and splinters travel upwards at an angle from the point of burst, the **best precaution is to get under cover as low down as possible**. It is better to get behind some kind of wall or other protection than to remain in the open. It is safer to lie down than to stand up. If one is indoors, it is safer to be in a soundly-constructed ground-floor room than in an upstairs room ; and it is much safer in a trench covered with two feet of earth than inside a poorly constructed house. For most people the **safest** and most easily

constructed shelter is an outside trench or dug-out, covered with a good layer of earth or ashes or sandbags. If it can be made gas-proof, so much the better.

Thus, the position is that, although most people in a raided area may have to take the chance of a direct hit, they can do much to protect themselves against other dangers of high explosives. **It is, therefore, the clear duty of every householder to take steps NOW to ensure that his family will have this protection in one or other of the possible ways about which ample information is available from Government and other sources.**

Several forms of shelter are described and illustrated in this booklet, including the Refuge Room (page 34), concrete shelters, steel shelters and covered trenches (Figs. 1, 6 and 8, and pages 38-43).

How to Deal with Fire.

It is quite possible that incendiary bombs will be employed against us on a large scale. To meet the danger, the nation's fire services have been greatly increased. Auxiliary Fire Posts have been established in all vulnerable centres, and, during a raid, firemen will regularly patrol the streets with hand- or motor-pumps and other appliances capable of dealing with small house fires.

Every person should have some knowledge of the local fire-fighting arrangements, and should know the location of the nearest Fire Post or Fire Station.

In a serious emergency, even the augmented services are not likely to prove adequate, so that as few calls should be made upon them as possible. **Every householder, therefore, should know how to deal with incendiary bombs (see below) and with a small fire.** To this end, he should have available, if possible, a stirrup hand-pump and hose, or a number of fire buckets (ready filled in emergency), whilst every member of the household should be carefully instructed how to use them and how to act if fire breaks out.

In the event of fire : (a) Close all doors and windows. (b) When you move about, keep close to the wall. (c) Flames and smoke are less thick near the floor, so if you must pass through them, crawl along the floor at the bottom of a wall. (d) If a person's clothes catch fire, roll him on the ground, or, if possible, roll him in a rug or blanket. (e) If you cannot deal with the fire yourself, get all the occupants of the house to a place of safety, and call the Fire Patrol, a policeman or an Air Raid Warden.

How to Deal with Incendiary Bombs.

An individual cannot alone deal with a large incendiary bomb. He must get the assistance of the Fire Brigade. By acting on the following simple instructions, however, a woman or even a strong child of 14 can easily control a small incendiary bomb and prevent it from setting a house on fire.

For this purpose, the householder must have available a garden hose, or a stirrup hand-pump, and plenty of water; a strong bucket

filled with sand ; a long-handled shovel and a garden rake. If he can afford it, he should get one of the specially made long-handled scoops and buckets of fire-resisting material known as the **Redhill Container and Scoop** (see Fig. 10).



Fig. 10

Controlling Incendiary Bomb with Redhill Scoop, Rake and Container

- (a) Placing sand on bomb (rake joined to scoop to make long handle) ;
- (b) Raking bomb into scoop ; (c) Turning over container (with bomb) before removal.

When a burning incendiary bomb is discovered, **all articles around it must be soaked with water** with an ordinary garden hose, or bucket and stirrup pump, great care being taken to prevent a **jet** of water from coming into contact with the bomb, otherwise showers of molten metal will be thrown off in all directions, thus increasing the danger of fire.

Incendiary bombs can then be controlled in one of two ways. One method is to cover the bomb with *dry* sand or earth or foamed slag, by means of the long-handled scoop or shovel, and to scoop or rake it, together with the controlling material, into a large metal pail containing 2 or 3 in. of sand. The whole is then thrown into a garden or backyard, where the bomb will harmlessly burn itself out. Any outbreak of fire must, of course, be dealt with at once by applying water from the hose or stirrup pump or from buckets.

Alternatively, the bomb can be effectively controlled by playing on it a **fine spray or mist of water**. Although it is dangerous to direct a **small jet** of water on to a burning bomb, or to throw water on it from a bucket, a gentle spray or mist makes the bomb burn out more quickly and helps to prevent the fire from spreading.

A fire patrol, or a fire squad in business premises, equipped with a **large hose**, can safely deal with an incendiary bomb from a distance by applying plenty of water both to the bomb and to all articles surrounding it. Although particles of burning magnesium will be scattered about, the quantity of water used will prevent the spread of the fire, whilst the water will make the bomb burn itself out in about 15 seconds.

Whenever a burning incendiary bomb has to be dealt with, always protect the eyes with dark glasses, and, if possible, protect yourself against the heat by strapping or tying a piece of asbestos or plywood (i.e., a buckler) to one arm and holding it in front of the face.

As further precautions in emergency, all baths, cans, tubs, etc., should be kept filled with water in accessible places ; all lofts and attics should be kept free of junk and inflammable material, and all woodwork (e.g., floors and roof joists) in upper rooms painted with fire-resisting paint, or lime-washed with two coats of a mixture consisting of 2 lb. of slaked lime and 2 oz. of common salt in 1 pint of water. Timber so treated ignites with difficulty.

Wherever possible, the floor of the loft or attic should be protected with corrugated iron, or plain sheet iron, or asbestos board, or with a layer of sand or concrete (provided the floor will bear the additional weight). This will delay or possibly prevent the bomb from burning through the floor and make its control less difficult.

Unexploded incendiary bombs can be quite safely picked up and dropped into a bucket of water or into a pond.

INDIVIDUAL PERSONAL PROTECTION AGAINST GAS

Individual personal protection against gas is provided by (a) The Respirator ; (b) Protective Clothing ; and (c) A Refuge Room or a Gas-proof Garden Shelter or Trench.

The last, if properly constructed, will also afford some protection against high explosive blast, splinters and falling shrapnel.

THE RESPIRATOR OR GAS MASK

The modern Respirator provides full protection against any known war gas for the eyes, nose, mouth and lungs. There are three types : (a) the Civilian, (b) the Civilian Duty, and (c) the Service.

Each of these respirators is fitted with a Container or Canister, which has *three essentials* :

- (a) AN INLET VALVE or Non-RETURN VALVE to admit air being breathed in but to prevent the passage through the container of air breathed out ;
- (b) AN ADSORPTIVE MATERIAL¹ (activated charcoal²) to adsorb¹ the dangerous gases, and
- (c) A FILTER OF ASBESTOS WOOL OR FEATHER DOWN to obstruct the passage of the dangerous particles in poison smokes. (See Figs. 3 and 4.)

¹ **Adsorptive, Adsorb.**—The particles of gas adhere like a film to the surface of the tiny particles of charcoal.

² Charcoal, produced by slowly burning substances such as wood, nutshells and bone at low temperature and thereafter subjecting the material to steam at very high temperature.

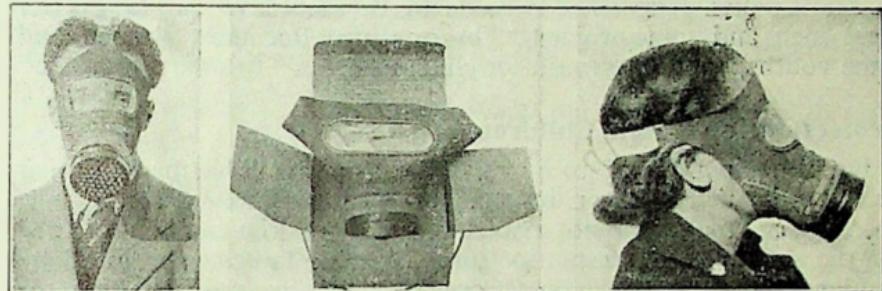


Fig. 11
Civilian Respirator

- (a) Front view, showing position of eyes ; (b) Respirator in storage box ;
(c) Side view of lady : straps level, hair well drawn back from ears.

Civilian Respirator (Fig. 11).

This type, which is supplied free to every civilian, consists of a facepiece to cover the eyes, nose and mouth, made of thin sheet rubber and embodying a large two-eye piece or window of non-inflammable transparent material. The tin container is attached to the facepiece by means of a rubber band.

The respirator is kept in position on the head by means of three adjustable webbing straps which, after adjustment on the wearer's head, are fixed in position by a buckle and safety pins.

All air breathed in by the wearer of the Civilian Gas Mask must pass through the container, but air breathed out is prevented from passing through the container by the non-return valve on top, so it passes out between the tight-fitting rubber facepiece and the wearer's cheek. By this means, moisture in the breath is prevented from damaging the container and its contents.

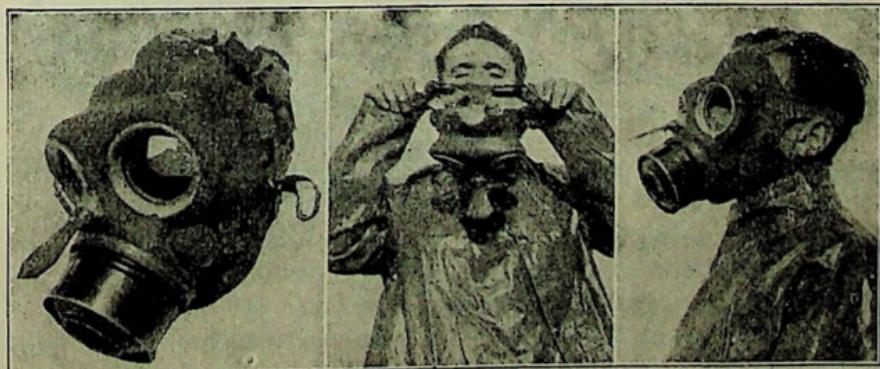


Fig. 12
Civilian Duty Respirator

- (a) Showing outlet valve on front of container, protuberance on left side for microphone elastic headharness, and removable eyepieces ;
(b) Putting on Respirator ; (c) Respirator as worn.

The Civilian Respirator is made in three sizes: (a) large, for most men and some women; (b) medium, for most women and some youths; and (c) small, for children.

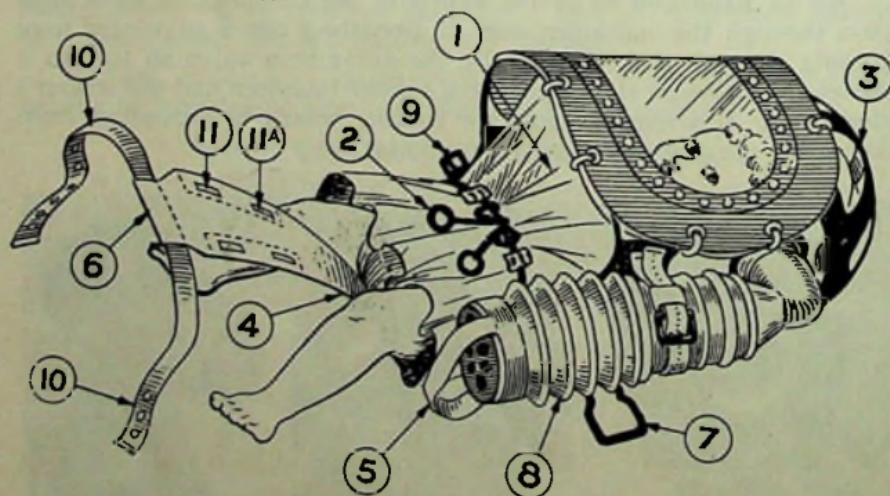
Protection for Small Children.

For children from 2½ to 4 years, there are available masks similar to the ordinary respirator, but they are lighter and are decorated. If these special masks are not available, small children can be protected by the small civilian respirator, provided the facepiece is lifted by tightening the strap which passes over the top of the head. The eyepiece will be above the level of the eyes but protection will be complete so long as contact is made round the face.

As small children do not, as a rule, take well to respirators, it is best to arrange for their evacuation to safe areas, or for their accommodation in a refuge room or shelter where the use of a respirator will not be necessary.

Babies' Protective Helmet.

The Babies' Protective Helmet is intended for babies and little children who are too small to be fitted with gas masks. It consists of a large fabric hood which completely encloses the head, shoulders and arms of the baby, and is kept filled with air filtered through a container by the steady operation of a bellows (8) by the child's parent or nurse, whose right hand, as the child is being nursed, fits conveniently into the loop (5) at the end of the bellows.



The lower part of the hood forms a loose skirt which is closely (but not too tightly) fitted round the child's waist by the draw tape (2), fastened in a bow so as to be easily undone.

The fabric hood is fixed inside a metal frame (3) with a padded underpart, which forms a support for the child's back and enables the child to be nursed in the normal way. The end of the frame is curved

to fit round the child's seat (4) and can be adjusted in length according to the size of the child. This curved part prevents the child from slipping down out of the protective part of the helmet.

Wire folding legs (7) fixed underneath the frame enable it to rest firmly on a flat surface.

Method of Fitting the Babies' Helmet.

1. Open the folding legs (7) and place the helmet on a flat surface.
2. Turn back the fabric skirt over the window, and see that the supporting strap (6) lies flat.
3. Adjust the length of the metal frame with the screws provided, so that the curved part (4) will fit conveniently round the child's seat (which should be protected with a napkin or towel).
4. Place the child in the hood, with one leg on each side of the supporting strap (6).
5. Smooth down the skirt of the hood and tie the draw tape (2) into a reasonably secure but not too tight bow. The child's face must be directly under the window, and its arms must be free to reach its face.
6. Fold over the supporting strap (6) between the child's legs and secure it by passing the canvas strap (10) through the buckles (9) on each side of the metal frame. The position of the canvas strap (10) can be adjusted if necessary, by passing it through metal slots (11 or 11A) in the supporting strap.

The helmet can be quickly fitted in this way, even on a troublesome child in spite of its resistance, and it will be found that the child soon settles down and goes quietly to sleep. **If there is gas in the air, the helmet must be kept on however much the child cries.**

Method of Operation.

When the helmet is fitted :

1. Operate the bellows sharply at least twelve times to clear the air inside the helmet.
2. Continue to pump air at a steady rate of about 40 strokes per minute.
3. The child can be safely left in the helmet **without operating the bellows for ten minutes, but not longer.**

The air enters the hood by a special opening in such a way that it does not blow directly on to the child's head, and so cause cold.

Method of Use.

A child protected by the helmet can be nursed on the lap or carried in arms in the normal way, **provided the bellows are regularly used in the manner described.**

If the child has to be carried for some distance, the legs of the frame should be folded underneath, and the weight supported with a wide shawl or broad cloth band, placed round the shoulders of the person carrying the baby. If it is desired to put the child down, the folding legs must be opened out flat to prevent the helmet and child from rolling over.

Important Note.

A child placed in a helmet, fitted and operated as indicated, is **absolutely safe from gas for any length of time**. The bellows is attached to a container similar in function to that of an ordinary gas mask. **But the necessity for operating the bellows regularly must not be forgotten, otherwise the child will suffocate.**

Civilian Duty Respirator (Fig. 12).

This is designed to protect members of certain branches of the Air Raid Precaution Services, such as **Air Raid Wardens, First Aid Parties, Nursing Staffs, and all personnel who may have to work in the presence of gas.**

It consists of a **thick moulded, close-fitting rubber facepiece** directly attached to a canister similar to that of the Civilian Respirator, but it differs from the latter in that (a) it is provided with two removable eyepieces of plain glass fitted into metal rims: and (b) it has **both inlet and outlet valves**.

The inlet valve on top of the canister is the same as that on the Civilian Respirator, but the outlet valve, of sheet rubber, is fixed on the front part of the facepiece because the mask fits so closely to the face that air cannot pass out between the mask and the cheeks, as in the Civilian Respirator.

The Civilian Duty respirator has also a protuberance on the left side for attachment to a microphone when the wearer is engaged on telephone work. It is held on the face by means of six adjustable elastic bands and, when not in use, is carried in a canvas haversack. In this is also carried a small tin of **anti-dimming compound** for use on the eyepieces, on the inside to prevent dimming by the breath and on the outside to prevent dimming by mist or rain.

In the most recent patterns the eyepieces are fitted on the inside with thin removable discs of gelatine-coated material to prevent dimming by the wearer's breath.

The Civilian Duty Respirator is made in **two sizes**. (a) **Normal** for most men, and (b) **Small**, chiefly for women.

Service Respirator (Fig. 13).

This is used by the **armed forces** and also by the **Police, Decontamination Services, etc.**, whose duties may require them to remain in high and dangerous concentrations of gas for long periods.

This respirator consists of a closely-fitting facepiece of hand-moulded khaki-covered rubber fitted with two non-splinterable removable eyepieces, similar to those of the Civilian Duty Mask. It is held firmly on the head by adjustable elastic headharness, and to the front is attached a highly efficient outlet valve which allows air to pass outwards only and **does not hamper speech**.

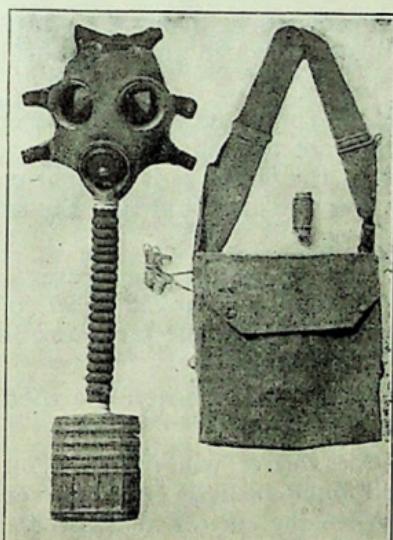


Fig. 13

Service Respirator with Haversack

Showing (a) Whipcord for fixing haversack on chest; (b) Tin of anti-dimming compound; (c) Haversack flap open; (d) Special container; (e) Flexible tube and special outlet valve; (f) Removable non-splinterable eyepieces.

At the bottom of the valve is fixed a flexible, corrugated rubber tube, covered on the outside with a khaki material, leading to a tin container of larger and more robust construction than that used on the other types of respirator. The Service Respirator is carried in a khaki haversack, which also contains a container of anti-dimming compound. (See Fig. 13.)

The Service Respirator is for use for long periods at a time in conditions where it is the wearer's one and only line of defence against poison gas. It is, therefore, made to retain its efficiency for a longer period than the other types, and to give the wearer the maximum freedom of movement and clear vision. To this end, the container is of large size and its weight is carried on the chest; the facepiece is made specially strong and is so constructed that air breathed in through the container and tube passes through channels (the "Tissot" channels) in the rubber wall of the facepiece to an inlet between the eyepieces, whence it passes across the eyepieces and so reduces inside dimming caused by condensation of moisture from expired air.

To ensure extremely close fitting, the Service Respirator is made in three sizes: (a) Large; (b) Normal, and (c) Small.

FITTING RESPIRATORS

In fitting a Respirator, attention must be given to the wearer's (a) Protection ; (b) Comfort ; and (c) Efficiency whilst working or moving about.

Fitting the Civilian Respirator. (Fig. 14.)

With the Respirator held up by the webbing-straps and with the straps well open, the wearer thrusts forward his chin, the straps are drawn over the head, and are adjusted through the iron buckle at the back of the head.

Care must be taken to see that the rubber edges of the facepiece are not turned in, that the straps are not twisted, that the buckle is centred on the back of the head, that the facepiece is straight on the face with the two side-straps level over the ears, and that the rubber of the facepiece fits tightly under the chin.

The facepiece must not fit too tightly against the wearer's eyebrows ; and the wearer's eyes should appear *near the middle* of the transparent window. If the eyes are too high, the facepiece is too small : if too low, the facepiece is too large.

In general, men require the large size, women the medium size, and children the small size.

If the Respirator is gastight, the wearer will find difficulty in breathing in when a sheet of cardboard is held tightly over the bottom end of the container. When the correct fit is ascertained, the position of the buckle on the straps is marked by a pencil line and the straps are secured with the safety pins provided so that no further adjustment for the wearer will be required to make the Respirator ready for use.

Spectacles cannot safely be worn under the Respirator.

To REMOVE THE CIVILIAN RESPIRATOR : Holding the container in the left hand, insert the thumb of the right under the buckle at the back of the head and pull the buckle forward over the top of the head so that the Respirator is lowered downwards from the face.



Fig. 14.
Fitting Civilian Respirator

(a) Front view holding headstraps ; (b) Side view with chin well out, before putting on ; (c) Testing for gastightness with cardboard ; (d) Removing Respirator.

The Respirator must not be removed by grasping the container, or the edge of the rubber under the chin, and lifting it off upwards. This stretches the rubber, spoils the fit, and tends to loosen the container.

Fitting the Civilian Duty Respirator.

This is fitted and tested for gastightness in much the same way as the Civilian Respirator, except that, as the headharness is made of elastic, it must not be fixed too tight for comfort nor so slack as to permit leakage of air between the facepiece and the wearer's cheek or chin. The wearer's eyes should appear in the centre of the eyepieces and the jaws should work freely.

NORMAL POSITION: When the Respirator is being carried but is not likely to be required for immediate use, it is slung in the canvas haversack (over all other equipment) at the left side to the back of the wearer's body.

ALERT POSITION: When gas is likely to be encountered, the haversack, with its mouth fully open, is slung on the left hip, free of all other equipment.

REMOVAL: Place two fingers of the right hand under the chin of the facepiece and lift it upwards and backwards over the head.

Replace the Respirator in the haversack by holding the facepiece with the valveholder in the palm of the right hand, thumb on one eyepiece, fingers on the other, folding the headharness inside the facepiece, squeezing the eyepieces together, and pushing the facepiece in the haversack forehead portion first.

Quick Adjustment of the Civilian or Civilian Duty Respirator.

1. Hold the breath, throw off headgear and remove spectacles (if any).
2. Pick up Respirator, hold in front of face with the thumbs underneath the sidestraps.
3. Thrust the chin forward into the Respirator and draw the straps right over the head.
4. Breathe out and continue breathing in normal manner.
5. Adjust the Respirator squarely and comfortably on face. Make sure that (a) the edges of facepiece are not doubled inwards, (b) the straps are not twisted, (c) the sidestraps are nearly horizontal, and (d) the buckle rests flat on the back of the head.

Fitting the Service Respirator.

The facepiece of the Service Respirator is fitted in exactly the same way as the Civilian Duty Respirator, but, in testing for gastightness, the rubber connecting tube must be squeezed near the bottom end to prevent the intake of air.

NORMAL OR SLUNG POSITION: The Respirator is carried in the haversack (with the press buttons closed) on top of all other equipment at the left side of the body.

ALERT POSITION: The haversack (with press buttons open but flap folded over to keep out rain) is secured on the front of the chest.

by passing the whipcord through one "D" ring on the haversack, round the wearer's back through the webbing sling, and securing it with a slip knot to the other "D" ring.

GAS POSITION: When gas is encountered, the facepiece is quickly withdrawn from the haversack by grasping the valveholder. With the headharness hanging from the thumbs the chin is thrust in, and the headharness is then drawn smartly over the back of the head. The flap of the haversack is kept open and the container remains in the haversack.

REMOVAL: The Service Respirator is removed in the same way as the Civilian Duty Respirator. The headharness is folded inside, the eyepieces squeezed together, and the facepiece replaced in the haversack forehead portion first. The haversack is then returned to the "Slung" or "Alert" position, according to the circumstances.

GET USED TO YOUR RESPIRATOR BY REGULARLY WEARING IT FOR SHORT PERIODS

Further, to obtain greater confidence in the Respirator, and to get first-hand acquaintance with the smell and visible characteristics of war gases, take the opportunity of wearing a respirator in a municipal gas chamber or gas van and of inspecting and testing the specimen gases that are available there.

CARE OF THE RESPIRATOR

As the life of the owner may depend on the Respirator, it must be kept absolutely efficient and treated with the greatest care. The contents of the container do not deteriorate with age or use in ordinary air, but all other parts require attention if they are to last.

If the shape of the facepiece (and so its gastightness) is to be preserved, it must be put on with great care so as not to damage the rubber, headstraps and other perishable parts. The transparent window of the Civilian Respirator, especially, requires careful treatment. It must not be bent, otherwise it will become cracked or pierced and let in gas.

When not in use, the Respirator must not be carried or hung up by the headstraps. It must be carefully packed in the special box or haversack provided and kept in a cool, dry, clean place. The Respirator must at no time be exposed to strong light, heat, intense cold, or moisture. It must never be dried before a fire or by the sun. Heat, dirt, damp and damage will destroy its efficacy.

Great care must be taken (a) to prevent water from entering the container, as moisture destroys the adsorptive properties of the charcoal, and (b) to avoid damage to the container walls.

The length of time for which the container will afford adequate protection when used in a gas depends on the strength of the gas and on the period of the exposure. Under the conditions in which it is likely to be used the Civilian Container should afford effective

protection "for a long time" (official statement). The Civilian Duty Container can be used continuously with safety in a heavy concentration of gas for several hours, and the Service Container for a considerably longer period.

At frequent intervals, respirators must be very carefully examined to ensure that they are properly assembled, thoroughly efficient and gastight, that all perishable parts (windows, rubber, stitching, etc.) are still sound, that the container is not heavily dented or perforated, and that the valves are in thorough working order.

The eyepieces of the Civilian Duty and Service Respirators must be well screwed into their sockets, and the connecting tube of the Service Respirator must be thoroughly sound and gastight.

All Respirators must be carefully disinfected and dried inside and outside with a soft cloth after use before being put away. In the case of the Civilian Respirator, the rubber parts should be taken apart from the container and immersed in a 2% solution of **Formalin** for half an hour and then thoroughly washed in clean water and dried, whilst the container should be wiped over with a similar solution, left for 5 minutes, and thoroughly dried.

If the eyepiece of the Civilian Respirator has become smearable or opaque, it must be cleaned with water, treated with a thin film of **good-quality** toilet soap (**not carbolic**) and lightly polished. The film thus produced will remain effective for about one week; the treatment must be repeated before the Respirator is worn.

Disinfection of the Civilian Duty and Service Respirators requires special care and will be done only by trained persons.

Whilst a Respirator is in one ownership, it should be kept in a wholesome condition by periodical cleansing with disinfectant, not less than twice a year. **Every Respirator should also be disinfected whenever it changes ownership, or whenever it has been worn by a person with an infectious disease.**

Limitations of the Container.

The Respirator containers have been designed to give protection against all known war gases, but **not against such gases as Carbon Monoxide and Carbon Dioxide**, which, although not suitable for chemical warfare, may be encountered in either peace or war in dangerous concentrations, especially carbon monoxide—the chief constituent of coal-gas, coal-mine "after damp" and of car exhaust fumes.

The Respirator gives no protection against motor-car exhaust fumes, household gas, petrol fumes or ammonia gas.

The containers give protection against the finely divided poison smokes that might be used in war, but they are liable to become quickly clogged up if used as protection against the coarser smokes produced by a burning house or building.

As the containers do not supply or generate air or oxygen they afford no protection in an atmosphere deficient in oxygen.

PROTECTIVE CLOTHING

As a Respirator affords full protection only for the eyes, nose, mouth and lungs, complete protection for those who are likely to be exposed to the vapour or liquid of the blister gases (with their universal action and power to attack all parts of the body through ordinary clothing) must be afforded by special Protective Clothing completely covering the body. This is supplied free by the authorities to all persons whose duties involve lengthy exposure to gas.

Ordinary members of the public can, if they wish, purchase Respirators and protective clothing privately, but the type bought should be approved by the Home Office.

Leather is useless for protective clothing or protective boots because it is destroyed by boiling and so cannot easily be decontaminated. Leather also soaks up oily blister gas, and so causes danger from vapour and contact.

Lighter Oilskin Clothing. (See Coloured Illustrations.)

Some services (Police, Wardens, Firemen, First Aiders, etc.), are equipped with the Service or Civilian Duty Respirator, light yellow oils skin trousers, short anti-gas coats and gloves, rubber knee boots, and a steel helmet fitted with a curtain to protect the neck and ears against gas spray. They are also provided with transparent eyeshields as a protection against blister gas spray.

Dressers and undressers in Cleansing Stations wear the Civilian Duty Respirator, long-sleeved overalls or smocks of yellow oils skin (tied up round the neck), Wigan-cloth gloves and wellington boots

The Heavy Full Protective Suit. (See Coloured Illustrations.)

This is worn by those who have to work in the most dangerous exposures, e.g., Decontamination Squads. It consists of the Service Respirator, a black heavy oils skin jacket and trousers (similar to those worn in the Navy), rubber wellington boots, gloves, and hood of light yellow oils skin or oiled Wigan cloth. Special porous underclothing is also supplied.

When the greatest danger to the wearer is exposure to gas vapour, the hood should be worn inside the jacket, the jacket inside the trousers and the trousers inside the boots. When, however, the greatest danger is from gas spray or from liquid blister gas getting down the neck and body, the hood, jacket and trousers must be worn outside, and tightly tied up with the belt and cords provided.

Effects of Protective Clothing on Wearer.

The human body is like a fuel-burning machine. It continuously generates heat and, if it is to continue in good running order, the heat generated must be carried away by radiation and evaporation of moisture from the skin and by warm exhalations from the lungs.

When the body is enclosed in a full protective suit it is more or less sealed in an airtight compartment with only a thin surrounding





CIVILIAN RESPIRATOR



REMOVING THE CIVILIAN RESPIRATOR



CIVILIAN DUTY RESPIRATOR



ADJUSTING THE CIVILIAN RESPIRATOR



VENTILATED GAS-PROOF SHELTER



RESPIRATOR SUPPLY DEPOT



CIVILIAN ANTI-GAS SCHOOL



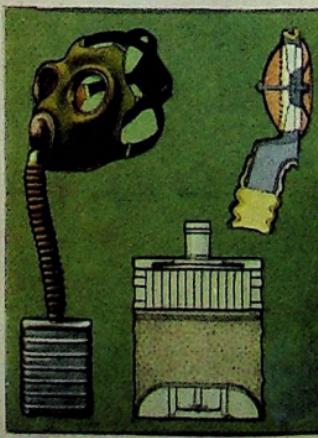
TRAINEES PASSING THROUGH MOBILE GAS VAN



A GARDEN DUG-OUT



A FRENCH GAS-PROOF BALLOON SHELTER



SERVICE RESPIRATOR, VALVE & CONTAINER

layer of air. This very quickly becomes saturated with moisture and carbon dioxide, and the body cannot give off further heat and moisture. The pulse rate quickens, the heat of the body increases, and ultimately there is collapse from heat-stroke. For these reasons, the addition of the airtight hood to the full protective suit reduces a man's efficiency by about 50 per cent.

Hence, there must be an interval for rest and recuperation of at least three hours in between each period of about half an hour's work in a full protective suit. In hot weather, even longer rest and shorter working time may be necessary. If the hood can be omitted, much longer spells of work are possible.

The lighter protective suits worn by wardens, police, etc., allow for a certain amount of air to reach parts of the body, and so they can be worn for much longer periods.

The heavy protective suit complete with hood should not be worn unless it is absolutely essential, and a person who is being dressed in the full suit must conserve his energy by letting the dresser do as much of the work of dressing as possible.

When a person in a full protective suit comes off duty, he will be undressed carefully by the dressers at the Cleansing Station (see below), and will wash thoroughly in soap and water. If any part of his body has been exposed to gas (e.g., by damage to his clothing), his eyes must be carefully doused, and bleach ointment or bleach cream must be applied to any parts of the skin on which the liquid gas may have lodged.

Precautions as to Vapour.

Because of the "bellows" effect produced by protective clothing when worn at work, vapour is sometimes sucked in and occasional airing is therefore necessary. This is done by opening the jacket and letting down the trousers.

Life of Protective Suit.

The life of the protective clothing will depend upon : (1) The severity of the work ; (2) the number of times the clothing is decontaminated ; (3) the care with which it is stored and decontaminated ; (4) the temperature in which it is used—the higher the temperature, the less will be the resistance against gas.

Period of Protection against Blister Gas.

JACKET AND TROUSERS—4 to 5 hours. HOOD—2 hours.
GLOVES AND BOOTS—4 to 5 hours.

Protective clothing that has been boiled will not be effective for as long as new clothing, and should not be relied upon for more than three hours in the case of the jacket and trousers, or one hour in the case of the hood.

THE REFUGE ROOM

For many civilians who will have Respirators but no protective clothing to safeguard them against blister gas and who have not access to any other shelter, the first line of defence in an air raid will be a Gas-proof and Splinter-proof Refuge Room. Such a Refuge Room can be prepared from any ordinary room at very little expense, but considerable care must be taken in choosing the room and in making it effective as a shelter.

CHOOSING YOUR REFUGE ROOM

Give preference to a soundly constructed room that can be easily made airtight and easily reached and left. It should have as few doors, chimney outlets and windows as possible. All the walls should be of stone or brick, and a concrete ceiling is better than a wooden one.

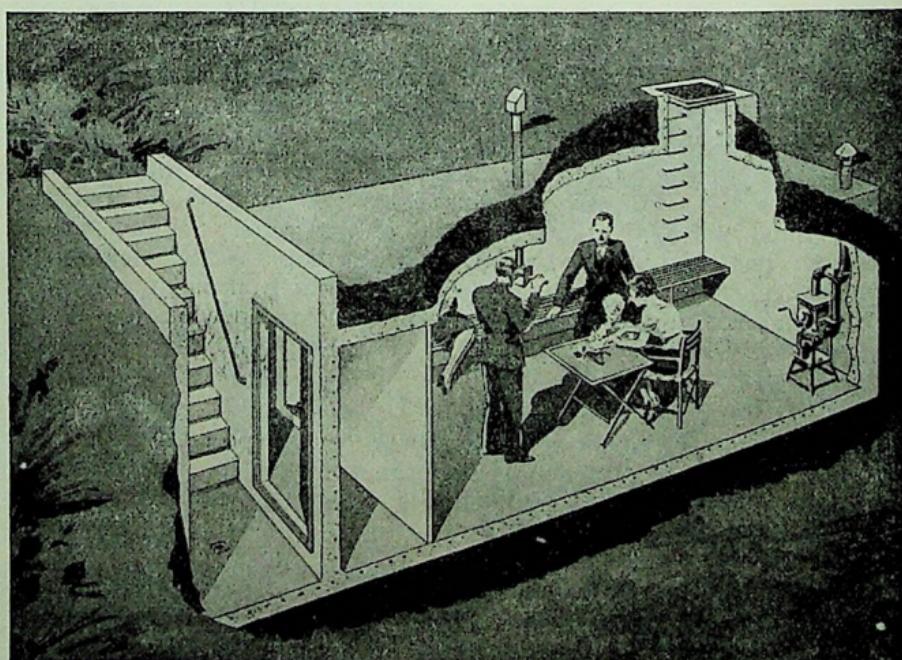


Fig. 15

An underground concrete Refuge Room, fitted with air-lock, periscope, gas-filter and emergency exit

This illustration and those on pages 35-36 are by courtesy of the Cement and Concrete Association, London, which will supply, on request, complete particulars and plans of various concrete shelters.

A dry cellar or basement that can be made gas-proof is the best, PROVIDED (a) that there is no danger of the cellar being flooded by an overflowing river or burst water mains or sewers; (b) that the walls and ceiling are sufficiently strong to support the collapse of the building upon them; and (c) that there is an alternative

means of entrance and exit, so that if one entrance is blocked by débris there is another way out.

Rooms on the top floor should be avoided because top floors and attics are not usually protected from small incendiary bombs. In blocks of flats, offices, tenements, etc., provision must be made on a lower floor for those on the higher floors, and a committee formed to decide upon and prepare the necessary refuge for all.

The Refuge Room should have small windows, and, if possible, should be protected outside by flank walls of adjacent buildings or other rooms, or face a narrow street.

A room looking out on soft ground, e.g., a garden, is better than one facing a hard surface, e.g., a road, where the effects of a bomb would be felt more severely, and, since gas is borne along by the wind, it is best to choose a room not exposed to the prevailing wind.

A kitchen or other room at the back of the house facing the garden is the best choice for most householders who have no cellars or basements.

As the occupants may have to stay in the Refuge Room for some considerable time, the room must be large enough to afford an adequate supply of air for all the people to be accommodated.

If we assume English summer conditions and that the occupants will be in the room for 12 hours, **100 sq. ft. of superficial area (walls, floors and ceilings) should be allowed for each person.** If pets are taken into the room, count two of them as equivalent to one person.

No. of Persons who can occupy Rooms of Size Indicated for 12 Hours.

SIZE OF ROOM.	PERMISSIBLE OCCUPANTS
10 ft. x 10 ft. x 8 ft.	5
15 ft. x 10 ft. x 8 ft.	7
20 ft. x 15 ft. x 10 ft.	13
30 ft. x 15 ft. x 12 ft.	20

A room that is fitted with a gas filter will, of course, accommodate more people, or accommodate the same people for a longer time, than a room that is not so fitted.

TO PREPARE YOUR REFUGE ROOM

To make the Refuge Room gas-proof you must seal up all obvious means through which air and gas can enter, e.g., chimneys, ventilators (including those below floor level), windows, skylights, hatches and doors, as well as all less obvious entries, e.g., cracks in the walls or ceiling, spaces between floorboards (even if covered with carpet or linoleum), waste pipes and overflow pipes in wash-basins or cisterns (unless there is an S-bend containing water), and crevices where pipes pass through the walls.

To seal up ventilators and chimneys use wetted paper, blanket, rags or sacks, and cover fireplace openings with plywood, plaster board or something similar.

Seal up all cracks and crevices at the edges of rooms, doors, fire-places, floorboards, skirtings, etc., with adhesive paper or with putty, or with a pulp made of sodden newspaper.

Windows. (See Fig. 8 and Coloured Illustrations.)

These must receive special attention. Wedge the frame tightly to prevent rattling, seal up any cracks (e.g., between the wall and the frame or between sashes and the frame) with gummed strip or pasted paper, and replace any cracked panes or paste them over with strong paper.

The panes themselves must be protected against the blast from explosives, otherwise this may break or crack the glass and leave the room vulnerable to gas. To do this, **cover the window opening outside with 2½ feet thick walls of sandbags or boxes filled with earth or sand or ashes**, and ensure that the sandbags, etc., extend at least a foot beyond the outside edges of the window.

To prevent injury to occupants from flying splinters of glass if the windows are shattered, **reinforce the panes** by pasting them over on the inside with stout paper or linen, or by covering them with thin sheets of celluloid or cellulose paper stuck to the glass with cellulose varnish or with water glass or ordinary gum. Alternatively, you can replace the glass with glass reinforced with wire mesh, or you can fix close-mesh wire netting inside each pane. (See Fig. 1.)

Even if you do reinforce the glass, you should make arrangements to **cover the window from the inside** in emergency so as to keep out gas if the glass is fractured or driven in. For this purpose, make a frame (of iron or wood, preferably the former, because it will keep its shape), so that it fits tightly on the inside of the window opening. Fix in this frame two layers of blanket material or rug reinforced with strong wire mesh, and **keep the blanket-window accessible so that you can quickly place it in position to keep out gas if the ordinary window is broken.**

When public warning of a raid is given, moisten the blanket with a solution of water and salt, soda or bicarbonate of soda, and keep a spare blanket available in case the original gets torn.

Doors. (See Fig. 1 and Coloured Illustrations.)

Lock and seal any doors in the Refuge Room which need not be used. Paste paper firmly over all cracks between the door and the frame, and plug the keyhole.

A door which has to be used must be made gastight. To do this, nail a piece of wood padded with felt to the floor, so that the door, when closed, presses tightly against it. Then nail strips of felt, or draught excluders, around the inside of the door. Fix a blanket outside the door (if the door opens inwards), or inside the door (if the door opens outwards), by nailing a strip of wood over the blanket along the top of the door frame, down its whole length on the hinged side, and a third of its length on the other side.

Leave the remainder of the blanket free so that people may pass into and out of the room, and allow at least a foot of the blanket to trail on the floor to stop air and gas blowing underneath it. When the air raid warning is sounded, moisten this blanket with water or with an alkaline solution (salt or soda and water).

Make an Air-lock.

Wherever possible, choose your gas-proof room so that you can make an air-lock (see Fig. 2) between the room and the outside entrance that you will use in an air raid, to enable anyone to enter or leave the Refuge Room in an emergency without admitting gas.

An air-lock is a space that is shut off by two gas-proof doors, or two gas-proof curtains (blankets or carpets). You can make it out of a lobby, vestibule or passage near the door, or out of a scullery or any other room through which you can enter the house from the outside, by making the outside and inside doors gas-proof.

Alternatively, you can make an air-lock of a passage by entirely closing in a space with hanging blankets not less than four feet apart, so that the first can be opened and shut again before the second is used.

Ensure that only the entrance to the house that is provided with an air-lock will be used during an air raid. Keep all other entrances locked, with the key in the door on the inside.

In large buildings, offices, blocks of flats, etc., in addition to an air-lock at the main entrance opening on to the street, a door at the entrance to each flat, where it opens on to the common stairway, landing or passage, must be made gas-proof.

It is as well to ensure that gas cannot too easily penetrate rooms other than the Refuge Room. Wherever possible, therefore, cracks, crevices, and openings in other rooms should be sealed up, and care taken in emergency to see that all doors and windows throughout the building are tightly closed.

Strengthening the Refuge Room.

The stronger the Refuge Room, the greater will be the protection against blast and splinters from high explosives, against flying or falling débris, and against collapse of masonry.

Brick walls will not afford adequate protection unless they are at least a foot thick, but you can easily strengthen them from inside by shoring them up with sandbags or 30-in thick boxes of sand, earth or gravel (See Fig. 8). "Sandbags" can be made with any bags or sacks of stout paper or fibre, and can, of course, be filled with earth or gravel or ashes, as well as with sand.

You can strengthen the ceiling of your Refuge Room by a layer of concrete or steel sheeting, and give it greater support by wooden or steel props, as shown in Fig. 1. It might be necessary, also, to strengthen the floor by fixing a plank across it or by inserting wooden blocks between the floor joists and the ground underneath. You can also strengthen the room by cross-buttressing the walls.

ESSENTIAL THINGS TO HAVE IN A REFUGE ROOM

A Roll-call List of all who should be present

Respirators for every person.	First-aid box, containing bandages
Electric torch and spare battery.	lint, cotton wool, smelling salts, sal
Electric light (if possible), otherwise candles and matches.	volatile, safety pins, iodine, bleach ointment.
Hammer and nails.	A good supply of water (in airtight containers) for drinking, etc.
Pieces of string.	Tinned food.
Some clean rags.	Plates, cups, knives, forks, tin-opener etc.
Plenty of newspapers and brown paper.	Books, cards, toys, etc.
Pots of paste.	Pick-axe.
Needles, cotton and thread.	A bucket or box of sand, a shovel and a rake to deal with a possible incendiary bomb.
Scissors.	A simple hand-pump and length of hose.
Gummed paper and adhesive tape.	A pair of non-inflammable dark glasses.
Tables and chairs.	A mattress or mattresses.
Portable wash-hand stand, or basin.	Dark curtain or blankets or carpets to obscuring windows.
A screen for privacy.	Material for protecting the window in- side and plywood for blocking up the fireplace.
Sanitary utensils and paper.	Blankets, for re-sealing windows if necessary, and for warmth. Also eiderdowns, rugs, etc.
Washing things: towels, sponges and soap.	Wireless set and/or gramophone.
Disinfectant.	
Airtight tins or jars for food.	
Flasks for hot tea, coffee, etc., or an electric kettle.	
Mackintoshes, goloshes, gum boots.	

TRENCHES AND SHELTERS

Unless a Refuge Room is made splinter-proof as well as gas-proof, has a reinforced ceiling and is in a strongly constructed building, it does not afford as much protection against high explosive blast and splinters as a trench, shelter or dug-out, carefully, though simply, constructed in a garden, lawn or other open space away from the building. In such a shelter the civilian is fairly safe provided he has a Respirator available in case gas is used.

Trenches.

In Figs. 6, 7 and 16 are illustrated types of blast-proof and splinter-proof trenches that can be quickly and inexpensively constructed in a garden. The first illustration is of a quickly-made, shallow, emergency trench, and the others of larger, more convenient and safer types.

For any of these, choose a level (if possible dry) patch of ground, about 7 ft. wide by 15 ft. long and at least 20 ft. from the house, to avoid danger from falling masonry if the house collapses.

The drier the trench the better; gravelly ground is much more suitable than clay ground and will provide better drainage.

The depth of the trench will vary with the type of soil—the heavier the soil, the shallower the trench—but the minimum depth should be $4\frac{1}{2}$ ft., so that the heads of occupants, when seated, are well below the surface of the ground. As the earth is excavated, put it alongside the top of the trench, so as to afford extra head shelter.

The trench should be about 3 ft. 6 ins. wide at the bottom, and about 4 ft. or 4 ft. 6 ins. at the top. To avoid earthslides and collapse of the side walls, line them with wire mesh and shore them up with boards and cross timbers (as in the emergency trench); or line the earth walls with corrugated iron, or asbestos sheets, or wood planks, supported by shoring timbers (as in the larger type), or with concrete supports (see Fig. 16).

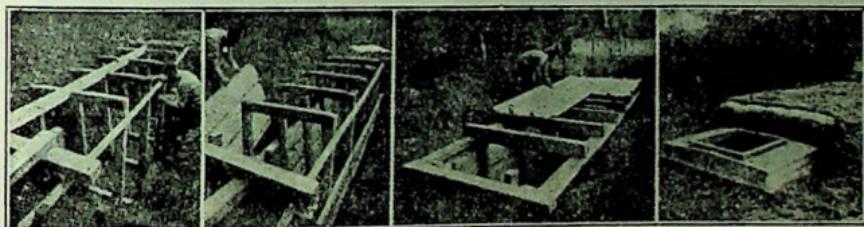


Fig. 16

Construction of a damp-proof trench with easily assembled concrete frame-work, and galvanised or asbestos sheeting. The entrance has a wooden or concrete hatchway. The completed trench is covered with sandbags and a layer of earth

If the ground is clayey or damp, dig a sump (which can be emptied) and fill the bottom of the trench with about 6 to 10 ins. of cinders or clinkers, and, if you can, cover these over with duckboards.

If water is struck when the trench has not reached its full depth, it is best to build banks of earth all round the top edges to get the required depth.

Except at the ends of the trench, cover the roof crosswise with planks or corrugated iron sheets covered with at least 6 ins. of earth with or without sandbags, to afford protection against flying splinters. **Creosote or tar all timber**, and see that the timber across the top is strong enough to hold the earth above it. See also that the roof slopes away to drain off rainwater.

Arrange a ladder or hatchway entrance at each end of the trench and cover this over with a wooden flap or trap, covered with tarpaulin etc., to keep out rain. **At each inside end of the trench itself hang a "gas curtain"**, i.e., a blanket or carpet weighted down with wooden crosspieces or slats, and with one foot trailing along the ground. When not in use, the blanket should be rolled up and tied in position, but in emergency it must be let down and kept wet.

It is an advantage to construct an air-lock at one end of the trench by hanging two blankets up at least three feet apart, but this, of course, involves adding three feet to the total length.

A trench 10 ft. x 4 ft. 6 ins. x 6 ft. should comfortably accommodate six persons for a period of three hours when the curtains are down. For each extra person over six, 18 inches extra length must be allowed. In the larger type of trench, a wooden bench can be conveniently fixed up along one side.

Trenches of considerable length to provide shelter for many people must be set in a zig-zag line so that the effects of a bomb falling on or close to one part of the trench will not travel the whole length



Fig. 17

Easily constructed family shelter built with concrete round a wooden framework, and protected with sandbags. The entrance is protected with a concrete slab raised vertically into position, when necessary

A covering of earth gives further protection

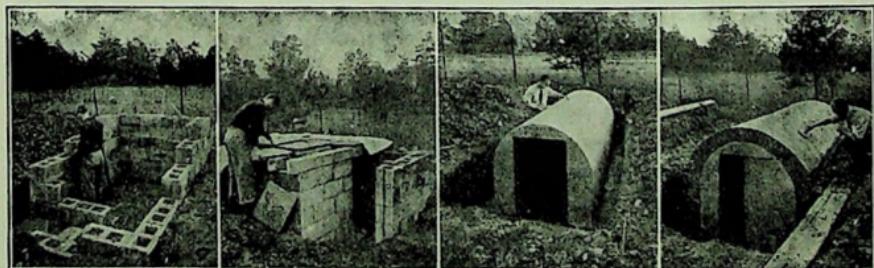


Fig. 18

Shelter made with easily handled concrete blocks and slabs. Earth is rammed into the spaces in the blocks. A covering of earth gives added protection

Inexpensive corrugated iron shelter, fitted with gas-proof door, reinforced with a layer of concrete and further protected with a covering of earth

Fig. 19

Concrete and Sheet Iron Shelters.

Trenches are invaluable as emergency shelters if no other protection is available, especially in open spaces in congested areas. But the objections to a trench as a shelter are that it tends to become waterlogged and unhealthy, that it is difficult to make gas-tight and hard to keep warm in the cold weather. Moreover, a trench cannot be made by householders who have no space available, or who have only a small backyard.

Neither trenches nor inside refuge rooms in many flimsily-built houses are as satisfactory as outside shelters, i.e., underground concrete or sheet-iron shelters or dug-outs, or partly-sunk

shelters made of sheet-iron or corrugated-iron, or of concrete, or of concrete and iron.

All such shelters are intended to be splinter-proof and blast-proof, and some of them gas-proof; but they will not afford protection against a direct hit unless very strongly and deeply constructed, and this can be done only at considerable expense.

A suitable type of underground concrete shelter is illustrated in Fig. 15, whilst three types of easily constructed partly-sunk shelters are illustrated in Figs. 17-19. That in Fig. 17 is merely a circular hole in the ground lined with concrete and sandbags. Fig. 18 shows a dug-out made with easily assembled concrete blocks, whilst Fig. 19 illustrates a cheap and efficient shelter of corrugated iron protected with a layer of concrete.

The degree of protection afforded by such shelters and dugouts depends on the thickness of the material of which they are made and on the depth to which they are sunk in the ground. The deeper they are the better. Surface or partly-sunk shelters of *reinforced* concrete are better than shelters made of ordinary concrete of the same thickness; concrete and sheet-iron or concrete and corrugated-iron are better than concrete alone; concrete is better than brickwork, but the latter is safer than ordinary earth or sand of the same thickness.

A sheet-iron or corrugated-iron shelter must be sunk into the ground and well packed round with earth so as to ensure its lateral strength, rigidity and safety, otherwise it might get distorted and the occupants might be trapped inside. Moreover, most surface shelters require to be covered with a layer of about 2 feet of earth or ballast or sand both for added protection and for the sake of appearance. Some concrete shelters are ornamental, but they are expensive.

"Anderson" Shelters.

The corrugated steel shelters supplied by the Government free of charge to poorer householders (see page 62) are somewhat like that illustrated in Fig. 19.

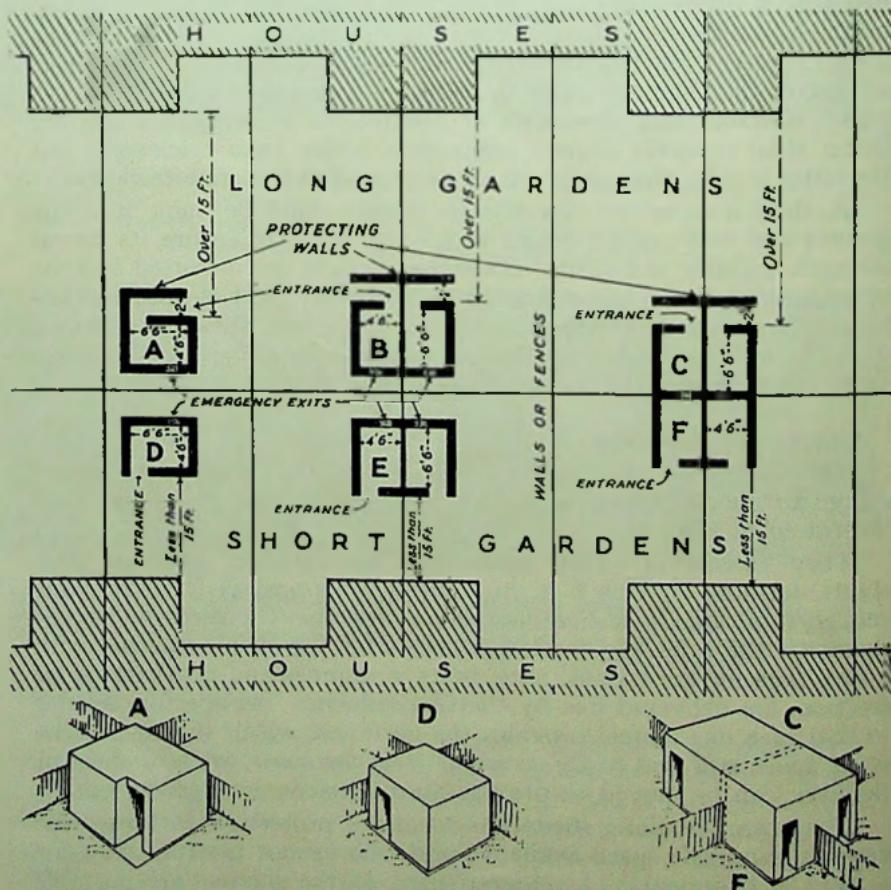
They consist of easily assembled, standardised sectional steel sheets, forming an arch 6 ft. high, 6½ ft. long and 4½ ft. wide, large enough to accommodate from four to six persons. The sheets (6 curved sheets for the sides and 8 straight sheets for the ends), together with 6 steel bars for the frames, nuts, bolts, a spanner and instructions for erection, are delivered free by the Government. An aperture similar to that of a dog kennel provides the entrance, which should be *close to the house wall and easily accessible from the house*, while a sheet at the back can be moved to provide an alternative emergency exit.

The object of these shelters is to afford protection to those who have little outside space available, and who cannot possibly set aside a room or basement as a refuge room. As the shelters are portable and easily-assembled, they can be moved and taken down without difficulty, whilst, in time of peace, they can be used as bicycle sheds, wood sheds, etc., and so save the inconvenience which would result, for example, from the presence of a trench in a backyard.

The Government is opposed to the erection of such shelters inside houses because (a) they would absorb accommodation which cannot be spared; (b) the danger of the occupants would be increased if the house collapsed, as the shelter would probably be forced through the floor; (c) the collapse of the walls might distort or displace the shelter, trap the occupants, and expose them to the danger of suffocation or of coal gas poisoning or, in the case of fire, of being roasted alive.

Government tests of these shelters (erected in accordance with instructions, sunk 3 feet in the ground and covered with 15 inches of earth) have proved that they afford excellent protection from blast and splinters (e.g., from a 500-lb. bomb exploding 50 ft. away).

DOMESTIC SURFACE SHELTERS (BRICK, MASS CONCRETE OR CONCRETE BLOCK)



State-provided Surface Shelters (see page 62).

For some householders in vulnerable areas with incomes under £250 per annum the Government is subsidising the construction of brick, mass-concrete or block concrete surface shelters.

The standard shelter has walls of $13\frac{1}{2}$ in. brickwork, or 15 ins. of pre-cast concrete block masonry (as illustrated on page 40) or of mass concrete. The roof is made of 5 ins. of reinforced concrete. Each shelter has an emergency exit, and where necessary a concrete floor.

The emergency exit is formed by a space or hole in the wall, large enough for a person to scramble through, filled with loose material (bricks or rubble or stones) and covered with two sheets of iron plate, bolted together from one side of the wall to the other, but readily removable in emergency.

The inside height is $6\frac{1}{2}$ ft., and for 6 persons the minimum internal floor area is 6 ft. 6 ins. by 4 ft. 6 ins. For 8 persons the dimensions are 6 ft. 6 ins. by 8 ft. 6 ins., and for 10 persons 4 ft. 6 ins. by 10 ft. 6 ins., and for 12 persons 4 ft. 6 ins. by 12 ft. 6 ins. All entrances and passages are 2 ft. wide.

Wherever possible the shelter must be erected within a distance of 6-15 ft. of the house so that the house will protect the shelter entrance, as in the case of shelters D, E and F in the diagram. If the shelter is erected more than 15 ft. from the house or from a solid wall, the entrance must be protected by a brick or concrete block wall (as in the case of shelters A, B and C) or by a thick mound or wall of earth or sandbags.

Where the gardens of two or more houses adjoin, a multiple shelter can be erected to accommodate two or more families, in which case it must have internal dividing walls of $4\frac{1}{2}$ ins. of brickwork or 4 ins. of pre-cast concrete blocks or mass-concrete. Shelters B and E are of the two-family type, while shelters C and F have a common centre wall and serve for four families, two with long gardens (C) and two with short gardens (F).

Portable Steel Conical Shelters.

The portable steel shelter is a type of shelter that is likely to come into considerable use as a refuge for persons whose duties compel them to be in the open during a raid, e.g., police, wardens, fire patrols and sentries.

Some of these shelters are made of solid, one-piece steel in the shape of a large bell with small look-out apertures. Others are of strong steel tubular shape, with a door at the side and conical, splinter-proof tops. Tests have proved that these shelters afford excellent protection against high explosive blast and splinters, as well as against falling masonry and débris.

PROTECTION OF ANIMALS

Wherever possible, dogs and cats should be sent to the country during war-time, or boarded with such organisations as the P.D.S.A. (People's Dispensary for Sick Animals), who have specially constructed kennels for their protection.

Otherwise they must be given protection (e.g., in gas-proof kennels, or they must be taken into the family Refuge Room. In this case two pets require as much air supply as one human being

(i.e., 100 sq. feet of surface area) or they can be temporarily housed in a kitchen dresser cupboard or wardrobe cupboard. The door should be firmly fastened and sealed with thick brown paper, and a damp blanket fixed over it. The top of the cupboard must be made airtight.

If no small cupboard is available, a large box or tea-chest can be used, provided it is properly sealed up.

Dogs and horses **are not affected by tear gas**, but are affected in the same way as human beings by lung irritants and blister gases. It is proposed to supply Respirators for horses.

PROTECTION OF FOOD AGAINST GAS

Chlorine and Phosgene will affect food with a pungent odour and bitter taste which make the food practically uneatable. Mustard Gas, however, leaves no taste in food, so that a loaf contaminated by a small spot of the gas might easily be eaten and prove dangerous, if not fatal. Arsenical smokes poison food and water.

Food must, therefore, be kept in airtight tin containers, sealed with adhesive tape, or in airtight bottles or closed jugs.

The use of unwrapped foods should be reduced to the minimum, and all wrappings must be kept on as long as possible. Waxed or greaseproof papers are better than ordinary paper, and can with advantage be used to cover food containers made of wood or cardboard which otherwise readily absorb liquid gas.

Any store place in which food is kept should be made as gas-proof as possible and provided with an efficient air-lock.

In retail stores, all foodstuffs must be kept in their special original wrappings, in cupboards or drawers, and **not displayed in windows, or on counters or shelves**.

Whenever possible, closed vans and trucks must be used for the transport of food, and foodstuffs that have to be exposed should be well covered with first quality tarpaulin.

A trader who distributes contaminated food may be held responsible for resulting casualties, and consequently liable to pay heavy damages.

The outside of food storage tins, bottles, etc., that have been touched by Mustard Gas must be treated with solvents and bleach cream to remove all traces of contamination (see page 54).

DISPERSAL OF GAS FROM ROOMS AND AREAS

If vapour gas enters a room, it must be removed as quickly as it can be safely dealt with, by persons properly protected with Respirators. All windows and doors must be opened to ensure ample ventilation and a large fire made to draw in fresh air from outside. Charcoal braziers or flap fans can be used with advantage and any exhaust or inlet fans that may be available should be brought into action.

HINTS FOR HOUSEHOLDERS

To Prepare for Emergency

1. Make sure that every person in your household is correctly fitted with a Respirator, that each knows how to put the Respirator on, and that all the Respirators are readily available for use in emergency. **Mark each box and the Respirator strap with the owner's name.**
2. Take the greatest care of your Respirators. Keep them in an accessible, cool, dry place, away from damp, strong light and heat.
3. If you cannot have a garden trench or shelter, prepare a Refuge Room and see that it contains the minimum requirements.
4. If you have a garden, **prepare a covered trench as a place of refuge against blast and splinters from high explosives.**
5. Ensure that windows in your house can be protected against blast and the entry of gas, and that they (as well as skylights, etc.) can all be covered at night so that light cannot be seen from the outside.
6. Keep a scoop and container (page 21) or a hose and hand pump available to deal with incendiary bombs.
7. Keep your top storey free from inflammable junk, and paint woodwork with non-inflammable paint or lime and salt wash.
8. Have a wireless set in the Refuge Room to hear official information and to turn on music during a raid to drown the sound of explosions. If you have no wireless, arrange to get messages from a neighbour in an emergency.
9. See that there are books or games to occupy children when in the Refuge Room.
10. Find out the position of the nearest public shelter in case you have to leave the house in an emergency, or in case you have no Refuge Room.
11. Find out the exact nature of the local system of Air-Raid Warnings.
12. Always carry your Respirator with you whenever you have to leave your home or place of business, and an identity label on which your name and address are clearly written.
13. Don't damage your gas mask by carrying it by the straps. Hold it by the canister.
14. Don't let the children play with their gas masks.
15. Don't wear glasses, or if a woman, a hair net, when you have to put on your Respirator.
16. Find out the address of the Air Raid Warden for your locality, and, if necessary, ask his advice on A.R.P. matters affecting yourself and your household.
17. Find out about the local fire-fighting organisation, learn what to do if fire breaks out and how to deal with incendiary bombs.
18. Learn what you can about First Aid.
19. If you live in a dangerous area, send your children, any invalids and elderly relations, and your domestic pets, into the country.
20. Get to know what you can about the local A.R.P. organisation, and see how it affects you personally.
21. If you can possibly do so, and your services are not required elsewhere, enrol in the A.R.P. Service, take a short course of anti-gas instruction for your own protection, and offer your car or van (if you have either) for use by the Air Raid Precaution Services.

HINTS FOR HOUSEHOLDERS

During a Raid

1. **Keep calm. Don't panic.** Obey instructions calmly and immediately
2. If you can get home, do so. If not, go to the nearest shelter or Refuge Room. If you cannot get to a shelter, sit in a doorway or under an arch, otherwise lie down flat on the ground. **Get off the streets.**
3. **If you are at home, at once close all doors and windows.**
4. Take the necessary extras into your Refuge Room.
5. Turn off all gas at the meter and put out all fires.
6. **Assemble in your Refuge Room, call the roll of those who should be present, see that each has a Respirator, and seal the room up.**
7. As twice as much air is used in walking about as in sitting still, **rest and keep quiet, under cover of the walls of the room and not in line with unprotected doors or windows.**
8. **Don't have smoking, fires, gaslight, plants or flowers in the Refuge Room.**
9. Don't wear a gas mask in your Refuge Room—it is not necessary unless gas is forced in.
10. **Don't lock the door of your Refuge Room.**
11. Don't rush into the street if you hear an explosion near by.
12. **Don't go out until the "Local All Clear" signal is given unless you are forced to do so.**
13. Don't hang about the street if you are forced to leave your Refuge Room, but go immediately to a neighbour's house or to a public shelter.
14. If you do go out after gas bombs have dropped, put on your respirator, a mackintosh and gum boots, and keep away from any areas, pavements, roads or buildings likely to have gas about them. Avoid especially any damp splashes that might be about on the ground.
15. **Don't interfere with the work of others such as wardens and fire-fighters.**
16. Don't open doors or windows until you hear the "Local All Clear".
17. If you do get contaminated with Blister Gas, throw off your outer clothing and, if you can possibly do so on the spot, wash your body thoroughly in warm soap and water. Otherwise, go at once to the nearest cleansing depot.
18. If gas is about and you have to wear your Respirator, **do not remove it without first testing for gas.** Take a deep breath, insert the fingers under the side of the facepiece and sniff gently. If you detect the smell of gas, keep the Respirator on until you are certain there is no danger or you get inside a gas-proof room.
19. If you are caught by gas when without your Respirator, or with a damaged Respirator, get your eyes thoroughly washed out as soon as you can and report at the nearest First Aid Post. If your lungs are affected, rest quietly until you can be conveyed to hospital.
20. On no account eat food that can possibly have been subjected to gas contamination.

FIRST AID AFTER AIR ATTACK

If there is delay in obtaining skilled assistance for injured persons, the householder or warden can render valuable help by acting in accordance with the following brief hints.

Types of Casualty.

Casualties after air attack may be:

- (a) **Slightly Injured**, but not gassed or contaminated . possibly suffering from burns, slight splinter injuries, cuts, etc.
- (b) **Severely Injured**, but not gassed or contaminated ; possibly suffering from haemorrhage, broken bones, concussion, etc.
- (c) **Uninjured but Gas-poisoned** by (i) tear gas ; (ii) nose irritant ; (iii) lung irritant ; (iv) blister gas.
- (d) **Uninjured but Contaminated**, i.e., with their clothing contaminated by liquid blister gas.
- (e) **Injured, slightly or severely, as well as gas-poisoned or contaminated.**
- (f) **Cases suffering from shock.**

If there has been a gas attack, your knowledge of the gas used, plus the symptoms and statements of the casualties, will guide you as to what gas injuries to expect and how to proceed. (See Table on pages 48 and 49.)

If you have any doubt, always play for safety and assume the worst, i.e., if you are uncertain whether or not a casualty has been gassed, assume that he has been gassed. Moreover, if you have the slightest suspicion that gas is about, put a respirator on the casualty, and keep on your own Respirator.

Shock Casualties.

Nearly all casualties, even those who are not injured or gassed, will be suffering from shock, evidenced by paleness, faintness, loss of breath and weak pulse. If not severe, reassure the patient and get him taken home to bed. If severe, loosen all clothing and keep the patient lying down and warm until the ambulance arrives. Hot drinks can be given if the patient can swallow.

Slightly Injured, Ungassed Cases.

Do what you can for these and **do not call the ambulance unless it is absolutely necessary**. If it appears desirable, quickly bandage them up and send them for attention to a First Aid Post, unaided if possible, otherwise in the care of another person.

FIRST AID FOR NON-BLISTER GAS CASUALTIES

Tear Gases.

As stated, these gases are essentially "panic" gases intended to incapacitate rather than to injure. Hence, apart from reassuring victims that any damage done is only slight and temporary, little further need be done. Removal to a pure atmosphere will, in most cases, be sufficient and victims should be merely persuaded to go home and rest, and to obtain medical attention if not recovered in a few hours.

THE WAR GASES

SUMMARY OF DESCRIPTION, EFFECTS AND FIRST AID TREATMENT

NAME.	DESCRIPTION.	SMELL AND OTHER VISIBLE SIGNS.	IMMEDIATE IRRITANT EFFECTS.	FIRST AID TREATMENT.	SUBSEQUENT EFFECTS.	SUBSEQUENT TREATMENT.
Diphosgene	Colourless liquid. Vaporises slowly. Destroyed by water.	Musty hay or rotting vegetation. Vapour invisible.	Irritation of nose and throat; tightness of chest; coughing, sneezing, choking, vomiting.	AIR, REST AND WARMTH. Remove victim from gas on stretcher. Keep quite still and warm. Prevent shivering and any undue muscular exertion. Loosen tight clothing; plenty of air to face. Artificial respiration is dangerous. Hot, sweet tea may be given, but no alcohol.	In a few hours damage to lungs appears.	Very mild cases may be carried home to bed, but most casualties will be HOSPITAL CASES. Medical attention; rest, warmth, and oxygen. Plenty of fresh air, light diet.
Chloropicrin (P.S.)	Yellow volatile liquid. Soluble in water.	Bleaching powder: pungent. Vapour invisible.				
Phosgene (C.G.)	True gas. Quickly destroyed by water.	Musty hay. White wisp of smoke on release, otherwise invisible.				
Chlorine (Red Star)	True gas. Soluble in water; corrodes metals.	Bleaching powder. Greenish cloud on release, otherwise invisible.	Phosgene produces tears. Chlorine: least irritant. Chlorine: most irritant, and inflames eyes.			
D.A.	Poisonous arsenical compound, released in fine particles, as smoke.	Practically odourless and invisible smoke.	After few minutes, sneezing, burning pain in nose, front teeth and gums; watering of eyes, nose, and mouth; pain in chest, vomiting, toothache, headache, and neuralgia.	REASSURE VICTIM. Remove to fresh air, and take off contaminated clothing, when effects quickly pass off. Gargle and nasal douche of bicarbonate solution; draughts to relieve vomiting. Any stimulant may be given, e.g., whiskey, rum, or sweet tea.	Mental misery and depression. Possibly temporary paralysis.	NO HOSPITAL TREATMENT. Rest and reassurance usually ensure full recovery.
D.M.	Do.	Do.				
D.G.	Do.	Do.				
C.A.P.	White crystalline solid. Vaporises when heated.	Indefinite smell. Vapour invisible.	C.A.P. vapour causes immediate watering and smarting of eyes with spasm of eyelids. Effects soon pass off in fresh air. C.A.P. only causes slight skin irritation.	REASSURE VICTIM. Remove to fresh air, and change clothing, when effects soon pass off. If irritation continues, wash out eyes with water or saline solution.	None.	NO HOSPITAL TREATMENT. None unless lung affected, then treat as for lung irritant.
B.B.C.	Yellowish-brown oily liquid. Vaporises very slowly.	Bitter-sweet; penetrating. Vapour invisible.	As for C.A.P. (but no skin irritation). Liquid B.B.C. severely damages and blisters skin. High concentration of B.B.C. vapour usually affects lungs.	As for C.A.P., but wash out nose and throat also.		
K.S.K.	Dark brown oily liquid. Vaporises slowly.	Pear drops or pineapple. Vapour invisible.	As for C.A.P. (but no skin irritation). High vapour concentration affects breathing passages.	Do.		
Mustard (H. S. "Yperite" or "Yellow Cross")	Heavy, oily liquid. Vaporises very slowly. Varies in colour from yellow to dark brown. Very soluble in fats, tar, oil and spirits, but very slightly in water. Great penetrative power.	Mustard powder, horseradish, onions, garlic. In weak concentrations, the smell is very faint, and not easily distinguishable. Liquid has iridescent effect on wet earth. Vapour invisible.	Liquid. Although damage begins at once, no immediate visible signs except when liquid enters eyes, when immediate irritation is caused, followed by smarting, watering, and swelling of eyelids in about an hour, when the eye closes. Vapour. Has no immediate effects on skin or lungs, but eyes irritated by heavy concentration.	PROMPT ACTION ESSENTIAL Remove outer clothing forthwith. Liquid. Wash eyes frequently with warm water or saline solution, and instil vaseline or medicinal oil. Treat contamination on skin (within 5 mins. if to be effective) with bleach, followed by thorough washing, or if bleach cannot be applied within 5 mins. treat with solvents. Do not merely wash thoroughly. (N.B.—Keep bleach away from eyes). Draughts of saline solution to check stomach trouble.	Liquid. Eyes. Unless treatment immediate liquid will cause blindness. Skin. Red patches form in a few hours, and develop after 12-24 hours into nasty blisters, which become septic unless carefully treated. Most severe effects on moist parts of body. Stomach. Nausea, pains, vomiting; pass off in 48 hours. May be badly injured by contaminated food.	HOSPITAL CASES, with skilled medical treatment. Mustard blisters must be preserved, kept thoroughly aseptic, and allowed to heal gradually.
Lewisite (M.L. or "Dew of Death")	Heavy oily liquid containing arsenic. Colourless if pure; brown if impure. Vaporises very slowly. Soluble in oil and spirit. Quickly destroyed by water and any alkali. Great penetration.	Geraniums (when crude). Odourless (when pure). Vapour invisible.	Liquid. Immediate tingling of skin, and pain in eyes.	Vapour. Wash eyes in saline solution, and whole body thoroughly in warm water. If possible, treat body with bleach paste or cream. (See note below.)	Eyes. Within 24 hours. Skin redness and blisters. Throat, bronchial and lungs become inflamed after 4-6 hours, and, after 12-24 hours, there is a hard, dry cough, loss of voice. Possibly bronchitis and pneumonia.	HOSPITAL CASES, with skilled medical treatment, while blisters must be surgically opened and drained of their dangerous arsenical content.

Mustard or Lewisite on Clothing.—Clothing known or suspected to be contaminated by liquid or vapour Mustard or Lewisite must be at once removed, and the whole body washed thoroughly with warm water and soap.

If, however, the victim complains of smarting or irritation after removal from the gas, the eyes should be washed out with a solution of one teaspoonful of salt to a pint of warm water, or irrigated with castor oil, olive oil or medicinal paraffin. Any stimulant may be given.

Nose Irritants.

Very little treatment is necessary after exposure to nose irritants, but as victims, though really unharmed, often experience feelings of abject misery and panic, tact and firmness are necessary. **The Respirator must be kept on until the patient is well out of the gas area.**

Irritation in the eyes, nose and throat is quickly relieved by **washing, douching and gargling** with a solution of one dessert-spoonful of bicarbonate of soda to a pint of warm water. If vomiting, patient can drink some of the solution. **Fresh air, rest and light diet** assist a quick recovery. Any stimulant may be given.

As particles of nose irritant smoke adhere to the outer clothing the casualty should remove his clothing and **(with Respirator on)** shake it thoroughly in the open air before he enters a house or First Aid Post.

Cases of arsenical poisoning caused by drinking water contaminated by the poison smokes must receive skilled medical attention.

Lung Irritants.

With the exception of the mildest cases, who may be sent home to bed by ambulance and advised to rest quietly for a few hours, persons who have been exposed to lung irritant gases require urgent medical attention. **They must be treated as stretcher cases, so as to obviate any exertion, and taken at once to a hospital.**

Whilst awaiting the ambulance, all tight clothing must be loosened and the victim kept thoroughly warm, but provided with plenty of fresh air. Whilst on the stretcher the patient's head should be turned on one side and kept lower than the feet for a few minutes at a time to encourage expectoration.

Fluids such as sweet tea, or water, may be given in sips, and the mouth kept as moist and clean as possible by regular swabbing.

Artificial respiration must never be attempted in these cases, as it will only aggravate or complicate the serious condition of a patient by placing an increased burden on the already damaged lungs.

It is always a great help to those who have subsequently to take casualties to attach a note stating what you have learnt 'ced of the case before removal from your care or what treatment, if any, you have given.

FIRST AID TREATMENT FOR BLISTER GASES

Blister Gas penetrates so quickly into the body that First Aid treatment, to be of any use, must be applied **within a few minutes after contamination**. If this can be done at a Cleansing Station within a minute or two, so much the better. If not, it must be done on the spot, e.g., in the victim's house. Moreover, the First Aid treatment is only a **preliminary** to proper medical treatment which **must be obtained with the least possible delay**.

Casualties whose lungs have been affected by blister gas **vapour** must be treated as contaminated lung-irritant casualties, i.e., they must be removed on a stretcher to a First Aid Post or Hospital.

If blister gas has affected the eyes, skin or clothing, **speedy treatment is essential to avoid injury**, and it is safest to treat every suspected case as contaminated, whether there is actual evidence of contamination or not. Hence :

Remove the casualty's outer clothing at once and throw it (e.g., out into a field or garden) where it cannot contaminate anyone else. Then wrap the casualty in a blanket, rug or other warm covering, pending treatment.

If there is any visible liquid gas on the skin, at once mop it off with clean rag or lint, and, if gas has reached the patient's eyes, **wash them out at once**. You may easily avert blindness by immediately putting a casualty's eyes under a running tap, or by pouring water into his eyes. If the casualty can be at once thoroughly washed all over in warm water and soap, so much the better. (See below.)

All blister gas casualties (other than lung cases) **must be treated as walking cases**, i.e., get them to walk to the nearest first-aid post or cleansing station. If you have to send them by car or ambulance because of the distance, **take care to lessen contamination of the vehicle by placing an oil sheet under the casualty**.

Treating Mustard Gas Liquid Contamination of the Skin.

Although washing with soap and water is likely to be the most generally and easily applied first-aid treatment for blister gas contamination of the skin, there are two other methods that can be used, viz., (a) **neutralisation** by means of bleach ointment or bleach paste : (b) **removal** by solvents, such as paraffin, petrol and spirit.

Washing with soap and water only removes the liquid contamination and does not immediately destroy the gas. If a small quantity of water is allowed to mix with a blob of blister gas on the skin, the resultant solution may increase the area of injury. When water is used, therefore, any visible liquid should be first mopped up with clean rags or lint, and plenty of water then applied, the waste being carefully disposed of where it cannot cause further injury.

The same is true of **Solvents**, such as paraffin, petrol or spirit. These readily dissolve Mustard Gas, and can be used to remove liquid contamination from the surface of the skin, but **great care is necessary because Mustard Gas is not destroyed by the solvent** : the solution has the same poisonous properties as the gas and will increase the **area of injury if allowed to run on the body**.

The visible liquid must, therefore, be mopped up with successive pieces of clean rag or lint soaked in the solvent, great care being taken not to spread it over a greater area. When the gas is removed wash the affected part thoroughly in warm soapy water.

Because of the possible danger of spreading the area of injury if water and solvents are used, the safest first aid treatment for blister gas on the skin is to destroy it by applying *bleach ointment* or *bleach cream*.

Bleach ointment is made by mixing equal parts of white mineral jelly (white vaseline) and of bleaching powder. **Bleach paste** is made by mixing bleaching powder and water into a thick cream.

If either of these can be applied to the contaminated part **within five minutes** of the contamination, they will effectively destroy or neutralise the gas and little harm will follow. After the bleach has been left on for about a minute, it is wiped off with a clean rag and the affected part thoroughly washed in warm soapy water.

Bleach ointment or paste applied after five minutes, i.e., **after the contamination has soaked into the skin, will only serve to aggravate the injury to the affected part, and must give place to thorough washing with soap and water, following which the victim must be passed forward for medical attention.**

Bleach must always be kept away from the eyes or it will cause severe irritation.

Skin irritation caused by blister gas can be relieved by applying calamine lotion or weak potassium permanganate solution (1 in 10,000) or diluted tincture of iodine (few drops in $\frac{1}{2}$ pint of water), or a diluted solution of sodium bicarbonate, followed by dusting with zinc oxide powder.

The washing method alone should be used only where the contamination is slight, or where solvents or bleach are not available.

Mustard Gas blisters must be preserved, i.e., not broken, and allowed to heal slowly.

Mustard Gas Liquid Contamination of the Eye.

The possibility of permanent damage from this most dangerous type of contamination can be reduced if correct and **immediate treatment** is given.

The liquid must first be removed mechanically by swabbing as soon as possible after exposure. The eyes must then be frequently and **thoroughly irrigated** with a warm saline solution or a weak solution of potassium permanganate. Afterwards, a little medicinal oil may be dropped into the eye, or a little vaseline may be smeared over the edge of the lids, to prevent the lids from sticking and to relieve pain and smarting. In severe cases, atropine must be introduced into the eye.

The victim should be assured that his sight is not permanently lost, and pressure by bandages and dressings carefully avoided. All such cases require skilled medical attention, and it is possible that the lungs will be affected.

Special Dangers of Lewisite.

In general, First Aid treatment of Lewisite cases is the same as for Mustard Gas cases, but Lewisite penetrates the body so much more quickly than Mustard that **any necessary treatment must be given at once**. Fortunately, the immediate recognition of Lewisite by its smell and its immediate irritant effects on the body lessens the dangers of long, unrealised exposure to the gas, while Lewisite is so quickly destroyed by water that if it can be got at quickly with water before it penetrates into the body, little damage will be caused.

LIQUID LEWISITE IN THE EYES will definitely cause permanent injury, but the effects may be rendered slightly less severe if treatment is applied immediately.

LEWISITE BLISTERS must be opened under surgical conditions to get rid of their dangerous arsenical liquid content.

SLIGHTLY WOUNDED AND GASSED CASUALTIES

Treat these in the same way as gassed casualties with First Aid attention to the injuries. Keep all wounds scrupulously clean and bandage up. Cover any burns or scalds with a clean, dry dressing, e.g., lint or cotton wool or a clean handkerchief, or with a dressing damped with weak tea or bicarbonate solution or tannic acid jelly. **Do not apply oil or butter.**

Send all except lung-irritant cases to the First Aid Post, and not to hospital, as any necessary treatment for simple wounds can be done at the Post. If you have to bandage a **gassed** patient try to do so in such a way that the bandage need not be removed when the patient is undressed for washing at the Cleansing Station.

SEVERELY WOUNDED, GASSED AND UN-GASSED

These are cases for skilled First Aid and medical attention, so summon such help as quickly as possible.

Do not attempt to move badly injured cases, e.g., cases with broken limbs or bones, **unless it is definitely necessary to lessen their danger**, e.g., from débris or fire.

In general, all you can do for such casualties until help arrives is to make them lie down, loosen their clothing, stop any bleeding, keep them warm, and support them as comfortably as possible with rugs, cushions, etc. If there is gas about, fit them with Respirators.

Give your attention in order to (a) bleeding (apply a clean bandage, or, if a limb is bleeding badly, a tight bandage—a tourniquet should be applied only by a person who has had First Aid training); (b) gas injury to the eyes (bathe frequently and thoroughly with warm water or weak saline solution); (c) shock, and (d) other gas injuries.

Gas injury to the skin is trivial as compared with (a), (b) and (c), so a severely wounded case must not be stripped for washing because of blister gas on his skin or clothing unless and until it can be done by skilled hands (e.g., in hospital).

PROTECTION OF MATERIALS

The poison gases—more particularly the liquid blister gases—are dangerous not only because they directly injure the person, but also because they contaminate structures, materials, household goods and food, making all of these sources of injury until they are destroyed or the contamination is removed.

No article known to have been exposed to gas should be used until it is certain that the contamination has been removed or destroyed. In general, decontamination should be carried out only by persons equipped with protective clothing and respirators.

The persistence of the contamination will depend upon the permeability of the material. If the material is **impervious** (e.g., glass or glazed tiles) all the contamination will be on the surface and can be easily removed or will be readily affected by weather conditions.

If the material is **pervious** (e.g., earth, tarmac and soft wood) the contamination will soak in like ink into blotting paper. Once the gas has soaked in, it is only very slowly affected by the weather and is extremely difficult to remove.

DECONTAMINATION OF INSIDE MATERIALS

To render **materials affected by liquid war gases** incapable of causing injury by contact, or by giving off dangerous vapours, they are subjected to processes known as **decontamination**, the method of treatment depending upon (a) the material contaminated ; (b) the situation of the contaminated material ; (c) the type or quantity of gas present ; (d) the danger likely to result from the contamination ; (e) the available supplies of materials which may suitably be used.

Methods of Decontamination can be considered under four headings:

- (1) **Removal** by hosing down with water ; or by wiping off with solvents, such as paraffin, naphtha, methylated spirit, or petrol, or by covering with earth and shovelling away. In hosing down, only a small jet of water must be used, to prevent splashing and so spreading the contamination.
- (2) **Destruction** by (a) **Boiling**, or (b) **Burning**, or (c) **Steam Injection**, or (d) **Neutralisation** by means of certain chemicals, e.g., bleaching powder or chlorine gas.
- (3) **Sealing**, i.e., temporarily covering with earth, sand or ashes.
- (4) **Weathering**, i.e., isolating and leaving to effects of weather (wind, rain and sun).

Contamination by Liquid Tear Gas.

Materials impregnated with liquid tear gas may be decontaminated by hosing down with water, covering with earth or sand or, in severe

cases inside a building, by treating with a mixture containing equal parts of glycerine and a 50 per cent solution of caustic soda. To complete the destruction of the tear gas, the last-mentioned treatment should be repeated two or three times.

Contamination by Liquid Blister Gases.

Mustard Gas and Lewisite are most rapidly rendered harmless by neutralisation. Lewisite is immediately destroyed by water, applied plentifully. Mustard Gas, however, is only very slowly destroyed by water, and the safest neutralising agent is bleaching powder (chloride of lime). This liberates chlorine, which readily destroys the gas.

The reaction is so violent when dry bleaching powder is used that explosion and fire may be caused, so it should always be first mixed with water to form a stiff paste (bleach paste) or with two parts of sand, or earth, ashes or sawdust.

TILES OR CONCRETE FLOORS, and all similar flat surfaces, should first be hosed down with water and then treated with bleach paste. Special care must be taken to brush the paste well into the joints between the tiles, and the bleach paste must be left in contact with the surfaces for some hours, before finally washing it off. If necessary, the treatment should be repeated.

DISTEMPERED WALLS should be well brushed over with thick bleach paste, over which newspaper is stuck, and then three or four alternate layers of paste and newspaper applied. These should be left on for 48 hours, after which the wall should be thoroughly washed and cleaned down and re-distempered. An undercoating of sodium silicate may be applied if necessary.

In the case of contaminated PAPERED WALLS, the paper should be removed and the same treatment applied as to a distempered wall.

PAINTED WALLS, provided that no time is lost, may also be similarly treated and afterwards given a fresh coat of paint. If, however, some time has elapsed before treatment can be applied, the paint must be completely burnt off and destroyed.

PAINTED WOOD (skirtings, windows, doors, etc.) Burn off paint, destroy scrapings and repaint.

HARDWOOD FURNITURE (oak, mahogany, walnut). Swab with paraffin, apply bleach ointment and leave on the wood for 48 hours.

WOODEN FLOORS OR UNPAINTED WOODWORK. Visible liquid gas on these can be mopped up with sand, earth or ashes and taken away, care being taken to dispose carefully of whatever material is used for the mopping up. When the liquid has been removed, the contaminated area must be thoroughly scrubbed with bleaching powder, sand and water, the mixture being left in contact with the contaminated area for not less than 24 hours. If any smell remains, it may be necessary to repeat the treatment several times.

If it is not possible to apply *immediate* treatment to unpainted wood, it is safer to remove and burn the contaminated wood.

FURNITURE. The method of decontamination depends on the material from which the furniture is made. If it is made solely of hard wood, most of the contamination can first be removed with a solvent, such as paraffin. Then bleach paste must be applied and left in contact for not less than 48 hours.

Although there are several methods by which the coverings on upholstered furniture may be decontaminated, it saves time and is much safer to strip the coverings and burn them.

METAL FITTINGS. Swab with paraffin and rub dry with cloths, which afterwards destroy.

RUGS, CARPETS OR MATS, if only lightly contaminated, may be rendered safe by being ventilated in the open for about 7 to 10 days. If there is gross contamination it is best to burn them.

LINOLEUM, if in very good condition, and if treated immediately, can be decontaminated by applying bleach paste; otherwise destroy.

CONTAMINATED CROCKERY AND EARTHENWARE UTENSILS can be rendered safe by boiling in water or a bicarbonate solution.

MATTRESSES can be decontaminated by treatment in a steam disinfecter, or they should be burnt.

DECONTAMINATION OF CLOTHING

The treatment of clothing contaminated by blister gas depends on (a) whether the contamination is by **vapour only** or by **liquid**; (b) on the degree of contamination; and (c) on the material.

Five methods are available: (1) **Washing in soap and water**; (2) **Weathering or airing**; (3) **Boiling in water**; (4) **Treatment by high pressure dry steam**; and (5) **Baking in hot dry air**.

By the boiling process, the blister gas is destroyed, but dangerous vapour *may* be given off. In the last two processes, the blister gas is evaporated, and dangerous vapour is given off. These three processes must, therefore, be undertaken only in specially equipped premises and by specially protected persons.

Vapour Contamination of Clothing.

Provided it is certain that no liquid contamination is present, airing in the open for a period of not less than 24 hours will normally be sufficient for **outer** garments. Light cotton and linen dresses and underclothing, however, must be *washed* in soap and water for at least 15 minutes and afterwards thoroughly rinsed.

Protective clothing (oilskins and waterproofs) can be freed from vapour contamination by being hung in the open air for from two to four hours.

Contamination of Clothing by Liquid Blister Gas.

This calls for more thorough treatment, which is in itself dangerous, and should be undertaken only at specially equipped premises by persons properly equipped with protective clothing.

WOOLLEN CLOTHING, BLANKETS, ETC. In these cases, special care is necessary to avoid damage or shrinkage. The clothing should be boiled in **plain** water for one hour, and **must not be stirred** while in the boiling water. **Soap or alkali must not be used.** The materials must be kept completely covered by the water.

LINEN AND COTTON GOODS. Boil, completely immersed, for 30 minutes in water containing a small quantity of soda. The soda prevents rotting because it neutralises acids produced during the boiling.

CANVAS AND SIMILAR MATERIALS. Boil for one hour in a solution of soda and water.

PROTECTIVE OILSKIN CLOTHING. Hose off any liquid gas on the clothing, then boil in **plain** water for 30 minutes and take special care to avoid destruction of the oiled surface. After boiling, hang the clothing in the open air to dry.

RUBBER BOOTS. Boil for two hours in **plain** water.

LEATHER GOODS cannot be satisfactorily treated by boiling, and, although it is possible to decontaminate leather by subjecting it to a process of baking or by the use of solvents *and* bleach, neither method is very satisfactory. It is best to avoid the use of leather articles where there is danger of contamination by blister gases.

DECONTAMINATION OF RESPIRATORS

Vapour Contamination.

VENTILATE for twenty-four hours in the open air, protected from the rain and bright sunlight. If any smell of gas still remains, treat for liquid contamination, as below.

Liquid Contamination.

CIVILIAN RESPIRATORS. The facepiece of a Civilian Respirator contaminated by liquid gas must be destroyed because boiling will ruin the transparent eyepiece. The container, however, will be fit for further use if covered with bleach ointment or cream for ten minutes and then thoroughly cleansed.

CIVILIAN DUTY RESPIRATORS and **SERVICE RESPIRATORS** when contaminated by liquid blister gases must be dismantled by skilled persons and all the rubber parts boiled for three hours. The containers and removable eyepieces should be covered with bleach paste **or** cream for ten minutes and then thoroughly cleaned.

HAVERSACKS contaminated by liquid gas must be boiled for one hour in soda and water and then re-waterproofed. Leather fittings will be ruined by this process and must be renewed.

DECONTAMINATION OF OUTSIDE SURFACES

The method of decontamination to be adopted for outside surfaces will depend on the urgency of the need for treatment: in other words

- (a) **What is the contamination?** e.g., Is it liquid (mustard) or a non-persistent, easily dispersed gas?

- (b) **Where is the contamination?** e.g., Is it in a heavy traffic centre or in the middle of a field where it is out of the way of traffic or pedestrians?
- (c) **How heavy is the contamination?** e.g., Is there a wide splashing of liquid gas, giving off dangerous vapour?
- (d) **What is the immediate danger to the public?** e.g., Is the gas in the centre of an important public place or thoroughfare such as a railway station?

Methods of Decontamination of Outside Surfaces.

IMPORTANT NOTE: Supplies of bleach or solvents must be conserved in war time and must not be used if cheaper means can be applied, i.e., hosing down or sealing with earth.

Removal	Destruction	Sealing	Weathering
Hosing down: Slow stream of water so as to avoid splash. Hose towards drains which have been previously treated with bleach powder.	Boiling } Both must be done where vapours will not cause any injury—away from main part of town. These are safest methods as the gas is destroyed and there is no further danger.	Cover with earth or ashes or sand, mixed, if possible, with bleach powder, and cover with 4 in. of earth. If no bleach is available, cover with at least 6 in. of earth.	Expose to sun, wind or rain. At least 24 hours is required in the case of spray contamination. It may be dangerous to leave the gas to the weather if there is much vapour given off.
Mopping up: Apply sand, earth or ashes and take the lot away. This is a temporary method, as where there is heavy traffic.	Chlorination: Whenever bleaching powder is applied it must be wet or there will be an explosion and a fire.		In both cases Rop off the contaminated area, and erect signs marked "Danger—Gas"
Solvents: Must be done immediately: solvent must be destroyed after use, otherwise it may prove dangerous. Any spirit may be used, such as petrol or paraffin.			

EXAMPLES OF TREATMENT FOR CONTAMINATED SURFACES

Light Spray Contamination: Hose down all surfaces within 30 minutes, otherwise cover with sand or ashes and leave to the weather, keeping traffic and pedestrians away for at least one hour.

Gross Spray Contamination: Quickly hose down all surfaces and continue washing for 10 minutes. Treat pavements and much-used roads with bleach cream, keeping traffic, etc., away until safe.

Heavy Liquid Contamination: Decontamination of open spaces is necessary only if near habitations or in way of traffic or pedestrians. In general, they can be roped off and left to the weather, no grazing being allowed on grass-land for 48 days.

Surfaces which must be decontaminated are treated as follows:

Removal: **HOSING DOWN.** Hard roads: tarred macadam; concrete floors; large iron and steel work and structures. (If possible, apply bleach cream for some minutes, then hose down, or apply dry bleach after wetting the surface, and then wash down.)

SOLVENTS. Small machinery and tools; weapons.

Destruction: **BURNING.** Long grass; wooden blocks or floors (if badly splashed); tarmac in important thoroughfares (using heating machines).

BOILING. Small tools; stretcher canvas.

CHLORINATION. Large machinery; iron and steel work (to be handled); wooden handles of stretchers; tools (e.g., of decontamination squads); stone sets of pavements; wooden floors and wooden blocks (if not badly splashed); stone or brick walls (after thorough hosing down).

Sealing : Gutters; roads (if removal impossible); earth; lawns; short grassland.

Concrete surfaces can be sealed by being brushed over with water glass (sodium silicate).

Weathering : Iron and steel work (when handling or contact not necessary); tools (if time available); water-bound macadam (apply dry bleach, if possible).

Vehicles (Carriages, Motor-cars, etc.).

These are very liable to contamination but complex to treat because they are made from several different materials.

The outside surface should be thoroughly hosed down over a drain, and any parts which come into contact with the person treated specially. Upholstery and tyres should be taken off and destroyed; fabric coverings and woodwork covered with bleach *cream* for 30 minutes and then washed down; bright metal and engine parts swabbed (or brushed as necessary) with paraffin and wiped dry.

ADMINISTRATIVE PROTECTION

Administrative Protection embraces all the arrangements made by the Central Government and Local Authorities to ensure the maximum amount of general protection for the civilian population.

The branches of the A.R.P. Services may be grouped as follows:

1. **Individual Protection Services**, i.e., the supply and distribution of Respirators, of Protective Clothing, and of other Equipment.
All such equipment remains Government property and must be cared for as such by the recipient.
2. **Communal Protection Services**, i.e., arrangements for the Evacuation and Redistribution of the Civilian Population from dangerous areas to places of greater safety; the provision of Communal and Domestic Refuges and Shelters; the organisation, training, and equipment of Police, Special Constabulary, and of Air Raid Wardens.
3. **Medical and Veterinary Services**, including the provision of adequate Medical, First Aid, Ambulance, and Hospital Services.
4. **Salvage and Repair Services**, i.e., the organisation and/or augmentation of Decontamination, Demolition, Fire-fighting, Rescue, Public Service Repair, and Road Repair Services.
5. **Ancillary Services**, e.g., Clerical and Stores Services; Emergency Food Supply and Transport Services.
6. **Intelligence Services**, viz., organisation of Report Centre, Public Warning System, Telephone and Messenger Services, Gas Detection Services, and Air Raid Wardens.

All training and special equipment for local authority A.R.P. workers is provided free, and all such personnel employed full-time during the war will be paid. Compensation is payable in respect of all such A.R.P. workers injured or killed whilst on duty.

In every town each specialist service is controlled by a responsible officer, and all (except the Fire Services—controlled by the Chief Officer of the Fire Brigade) are co-ordinated under the **Air Raid Precautions Officer**. Except in the largest towns, the A.R.P. officer, in turn, works under the general direction of a County supervising officer.

The various sections of the A.R.P. Organisation have had to do most important work in peace time to prepare for emergency. Additional action had to be taken from the time the Government declared a "State of War", whilst special arrangements have had to be made for the organisation of the work of each of the services (a) during an air raid, and (b) after an air raid.

COMMUNAL PROTECTIVE MEASURES

The Government, through the local authorities, has undertaken the task of organising the various essential A.R.P. services that the public requires in war-time, but cannot themselves provide. It has also arranged for the provision of the necessary specialist equipment and for the recruitment and training for these services of the necessary personnel, some of whom are responsible for instructing the public in A.R.P. methods, and for safeguarding them from the dangers that threaten.

Highly important in the general scheme are the Air Raid Wardens, whose duties are explained below, and also the augmented Police Services. Very important emergency duties in connection with A.R.P. and other matters now devolve upon the Police. They have, therefore, been strongly reinforced by Police Reservists and Special Constables.

The Observer Corps (for spotting enemy aircraft) is formed as a branch of the Special Constabulary, but its members are enrolled only for the special observer duty.

Apart from such general measures, the Government aims also at providing domestic and communal protection against the principal dangers of air raids, especially of high explosives.

Communal Protection Against High Explosive Dangers.

For a variety of reasons it does not at present seem likely that the construction of bomb-proof shelters (i.e., shelters that afford complete protection against high explosives) will be undertaken or encouraged by the authorities, except in large works, factories, arsenals, etc., of national importance, where the work must be carried on, where the personnel are all immediately on the spot, and can be thoroughly trained to take refuge in the shelters in an orderly, pre-arranged manner.

The Government does not regard the construction of bomb-proof shelters for ordinary members of the public as either necessary or practicable. It is considered, first, that no likely enemy power has sufficient superiority in the air to be able to bring over enough H.E. bombs to lay waste a substantial part of London or of our other great cities, and that an enemy (forced to use his highly trained airmen and extremely expensive aircraft and bombs to the best advantage) must concentrate on destroying a relatively small number of important objectives, such as military stores, railway junctions, electric power stations, and aircraft factories.

The second argument is that, as we shall have only from seven to ten minutes' warning of a raid, **there would not be sufficient time for all the people in a crowded district to get into public shelters.** Hence, at every air raid warning large crowds trying to reach the shelters would be dangerously exposed on the streets and roads (at points probably known to enemy pilots), and there would be dangerous confusion and panic-stricken scrambles at the shelter entrances.

Then there is the argument that **the ordinary citizen's chance of a direct hit is extremely small**, and that the greatest danger is likely to arise from explosive blast and splinters, from the collapse of buildings, from shrapnel fired by our own anti-aircraft guns, and, of course, from gas.

Against such dangers protection must be as widespread as possible, to cover people in or near their homes, as well as in or near their places of employment, and, in general, the smaller the groups in which people are dispersed, the fewer the casualties.

THE GOVERNMENT'S AIR RAID PROTECTIVE POLICY

The Government's Protective policy is, therefore, based mainly on :

(a) **Dispersal of People from Danger Zones**, involving the evacuation of as many people as possible (including schoolchildren, expectant mothers, the blind and infirm) from densely-populated, vulnerable areas ("War Evacuation Areas") to safer country districts and towns ("Refugee Reception Areas") where they are billeted in private houses or accommodated at country houses, converted holiday camps, etc. Certain less vulnerable areas (defined as "Neutral Areas") will be neither evacuated nor used for refugees.

(b) **Provision of Communal ("Pedestrian") Shelters and Trenches** in parks, squares, etc., of densely-populated areas for people who are in the streets at the time of a raid, as well as in all offices, premises, and works of public importance.

Trenches are steel- or concrete-lined, built in zig-zag fashion, and suitably divided off. Shelters, lined with concrete or steel plates, are constructed above or below ground and covered over with a thick layer of earth, gravel, or sandbags.

Communal shelters are also being provided in suitable basements and cellars, and in some areas by the construction of large **under-ground car parks** which, in emergency, can be readily converted into shelters.

(c) **Encouragement of Construction by all Householders who can afford to do so of Refuge Rooms, Shelters, Trenches or Dug-outs in their own homes.** (See pages 38-43).

The shelters referred to in d(1) below will, it is understood, be supplied by the Government at cost price to householders who are considered able to pay for them.

(d) State Domestic Shelters for Poorer Householders.

For those in vulnerable areas who cannot afford to provide themselves with shelters (householders with incomes under £250 per annum), the Government is supplying:

1. For small two-storied houses without basements, but with a suitable back garden or yard, easily assembled, standardised sectional shelters of strong corrugated steel sheeting. ('Anderson' Shelters—see page 41.)
2. For the conversion into shelters of suitable basements and ground floor rooms in blocks of flats and tenements, standardised light steel sheeting for strengthening the ceiling, and steel supports for carrying the additional weight of the strengthened ceiling.
3. For poorer householders who have no basements or suitable space for an 'Anderson' Shelter, grants for the construction of 'Domestic Surface Shelters' of brick or concrete (see page 42). Shelters and equipment supplied free by the State remain Government property and must be safeguarded as such by the recipient.

(e) **Compulsory Employees' Shelters**: As so little warning of an air raid will be given, very few employees of business firms, factories, etc., will be able to get home or to a public shelter. All employers of over 30 employees in vulnerable areas must, therefore, provide effective shelters on their business premises for all their workpeople. The Government provides full technical advice and information for this purpose. (See page 74.)

Summary of H.E. Protection.

Blast- and splinter-proof shelters are thus being provided in vulnerable areas:

1. FOR THOSE AT WORK, by the employer at the factory or office;
2. FOR THOSE AT HOME, by shelters within or outside the house, provided at the expense of either the State (poor people) or the householder (able to afford it);
3. FOR THOSE IN THE STREET AND FOR PERSONS FOR WHOM NO PRIVATE SHELTERS ARE AVAILABLE, communal shelters—either outside trenches or shelters, or inside shelters specially constructed in the basements or lower floors of offices, warehouses, blocks of flats, and other large buildings.

These arrangements will provide shelters for the great bulk of the population. But it is not unlikely that if war continues the Government will be compelled to go even further and provide in all vulnerable, densely-populated areas shelters that are fully protective against high explosive bombs and gas.

GOVERNMENT CONTROL OF FOOD SUPPLIES IN WAR

As Great Britain is essentially a manufacturing country, very dependent on large imports of raw materials and foodstuffs, one of the most important tasks of the Government in war time is to store adequate reserves of essential foods and to ensure the wise and just distribution of food supplies. If control were not instituted, the rich

would have ample food whilst the poor went without. The Government, through the **Food (Defence Plans) Department of the Board of Trade**, has, therefore, accumulated large stores of all essential foods and taken steps to increase home production of certain commodities.

Central and Local Control.

In war time, the **Ministry of Food** controls all supplies of essential foods, and all food traders, importers, manufacturers and wholesalers. Wholesalers of essential foods buy direct from the Government at regulated prices, while maximum retail prices have been fixed for such commodities as potatoes, sugar, butter, and eggs.

Local Food Committees, comprising representatives of local consumers, control purchases of essential foods by retailers, and issue licences to retailers permitting them to trade at regulated prices. No customer can buy unduly large quantities of any such commodities.

The chairman of each local food committee is the Food Executive Officer for the district, and is usually the Clerk of one of the Local Councils, who has a wide knowledge of local conditions.

There is no control of luxury goods.

Rationing of Food.

Certain foods are rationed: (a) butcher's meat; (b) bacon and ham; (c) sugar; (d) butter; (e) margarine; and (f) cooking fats. If war continues, the rationing system will be extended to other commodities.

Each member of a household has a **Ration Book**. **Householders can register at any retail shop for each food subject to rationing**, and the Local Food Committee ensures that necessary supplies of these foods are distributed to the retailer concerned.

The Ration Books contain a number of coupons, of which a fixed number are to be used each week. Each coupon represents a certain amount, **by weight**, of a controlled commodity, except in the case of meat. Meat coupons represent a given amount of **money**, so that the housekeeper can please herself whether to buy a larger amount of a cheaper cut or a smaller amount of a dearer one.

Different rations are available for different classes of workers. Heavy manual workers and adolescent boys are allowed more meat than sedentary workers. Seamen have weekly ration books, while special ration books are available for travellers.

A Child's Ration Book (for children under six) is the same as an adult's except that only half the amount of butcher's meat is allowed.

The ordinary citizen's ration book is to last for six months. Neither the ration books nor the coupons are transferable. Those people who

do not eat bacon but like sugar cannot exchange their bacon coupons for the sugar coupons of a person who likes bacon, and is willing to forego sugar. Coupons are valid only for the week for which they are dated, and cannot be saved up for use in subsequent weeks

Those who have meals in restaurants must take their ration books with them, and coupons equivalent to the amount of food they eat must be taken out. Sugar coupons need not be used in restaurants, as sugar coupons are to cover only actual purchases from the retailer. School children who take meals at school will have coupons taken from their books.

Milk is delivered once a day and only in daylight during war time.

Householders' Reserve of Food.

Though hoarding is severely condemned, the Government urges every householder to have always in reserve about **one week's supply of food**. This reserve should be drawn upon for everyday needs, and replenished immediately so that supplies will be kept as fresh and wholesome as possible.

Food for the household reserve must be chosen with due regard to the proper amount of energy-giving foods, minerals and vitamins required to keep a family in good health, and to provide a varied, palatable diet which will help to relieve the nervous strain inevitable in war time. The foods recommended by the Government¹ are : meat and fish in cans or glass jars ; flour ; suet ; canned or dried milk ; sugar ; tea ; cocoa ; plain biscuits. Many other tinned foods, such as vegetables, prunes, cereals, fruits and soups, are almost as satisfactory in their canned forms as when fresh.

Canned food can be safely stored in a **cool, dry larder**, and does not require cold storage. Food not bought in tins or cans should be kept in clean, dry tins with tightly fitting lids and the tins stored in a dry, cool place.

All jars, tins, etc., should be clearly labelled with the date of the purchase so that they may be used in strict rotation.

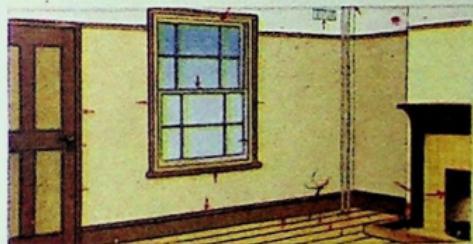
COAL AND LIGHT

In each of the twelve Defence Regions into which the country is divided there is a **Divisional Coal Officer** who is responsible for the rationing of coal, and in almost every town there is also a **Fuel Overseer**, who is in control of the use of all kinds of fuel in his district.

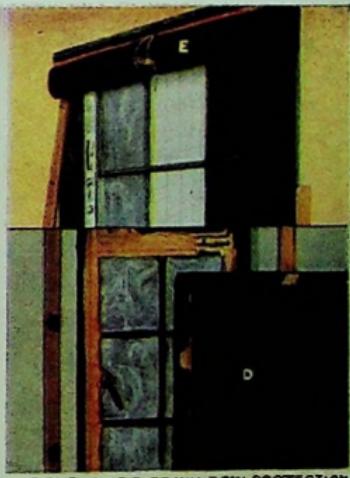
Under the Fuel and Lighting Order, supplies are to be conserved in case of shortage or dislocation. Consumers will be allowed per



SUITABLE REFUGE ROOMS



RENDERING THE REFUGE ROOM GAS-PROOF



VARIOUS KINDS OF WINDOW PROTECTION



A GAS-PROOF DOOR



TYPES OF SPLINTER-PROOF PROTECTION



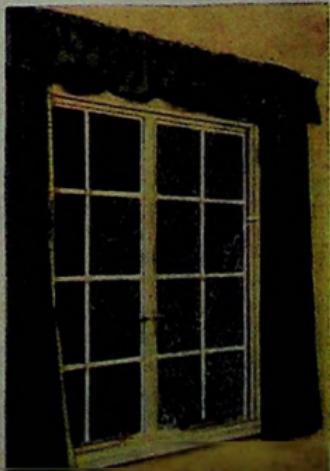
PROTECTING WINDOWS WITH SANDBAGS



EQUIPMENT FOR THE REFUGE ROOM



EQUIPMENT FOR THE REFUGE ROOM



BLAST PROTECTION OF WINDOW
CELOPHANE AND WIRE NETTING



HEAVY ANTI-GAS SUIT



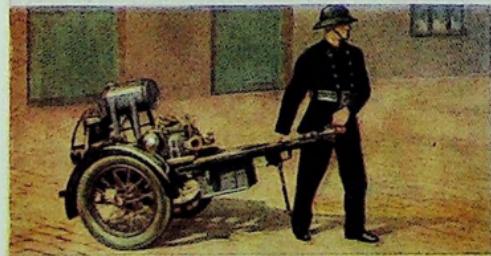
AIR RAID WARDENS AND CIVILIAN VOLUNTEER DESPATCH-RIDER



A FIRST AID PARTY



DECONTAMINATION WORKERS IN TRAINING



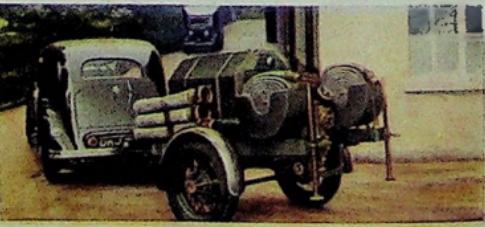
LIGHT TRAILER FIRE-PUMP



TESTING FOR GAS WITH DETECTOR STICK



REPRESENTATION OF BALLOON DEFENCE BARRAGE



MEDIUM TRAILER FIRE-PUMP



AIR DEFENCE CONTROL ROOM

quarter, 100 per cent. of the gas or electricity and 75 per cent of the coal they consumed in the corresponding quarter of the year ended 30th June, 1939. Coal merchants must register with their local fuel overseer and consumers of more than 2 tons of coal in the year ended 30th June, 1939, with a licensed coal merchant, and all orders for coal must be in writing. From 1st October, 1939, consumers who should register but have not done so will not be able to buy coal.

Consumers of coal below 2 tons per year are not rationed, and they are not required to register if they normally buy their coal in not more than 1 cwt. at a time. They must, however, obtain from the local fuel overseer an exemption certificate which they must produce when they purchase coal.

Consumers of gas and electricity are not rationed below 100 therms of gas and 200 units of electricity in a year. In the case of electricity, consumers taking supplies at the lighting flat rate are exempt from rationing, and those who have no other means of cooking are allowed a minimum of 1,000 units provided they apply for this increase.

These amounts will be found to be sufficient for the ordinary household, provided care is exercised in consumption. Householders should watch their meters most carefully to ensure that they are keeping within the stipulated allowances.

LIGHT OBSCURATION

As uncovered lights may reveal the presence of a crowded city or important works to enemy planes overhead, and so put the lives of many people in jeopardy, light obscuration is a highly important aspect of Air Raid Precautions. **A complete black-out is a permanent condition between sunset and sunrise so long as war lasts.** Street lighting is extinguished; lights on buses, coaches, trams, and railways are dimmed or effectively hidden from outside view, and glare from pit heaps, blast furnaces, and similar works must be screened.

The occupants of all houses and premises must ensure that all their lights can be properly obscured during the hours of darkness. **All inside lights in private houses, shops, offices, factories, etc., from windows, skylights, or doors, must be screened so that they cannot be seen from outside.** All outside lights, including illuminated signs and advertisements, public lights and traffic lights, must be cut down to a minimum, and those that are kept burning must be screened and capable of being extinguished rapidly at a moment's notice. Signs must not remain alight when there is no one available to extinguish them.

Partial obscuration is not sufficient: all lights must be obscured. A single light might spoil the effect of obscuring all the others.

For obscuring windows dark curtains and blinds are best. The best colours are black, brown, green and blue. The best materials are glazed Holland, Lancaster cloth, Italian cloth, rubberised cloth, and thick brown or black paper. Householders who cannot afford to buy new curtains can darken existing light curtains or blinds by soaking or painting them with dark oil-bound water paint or dark distemper. All blinds or curtains used to darken windows must be big enough to overlap the window space, and not to gape apart in a light breeze or draught.

Windows, fanlights and skylights that are difficult to cover with curtains or blinds, or that are not necessary for lighting purposes, should be painted with opaque distemper or paint, or pasted over with thick brown paper. As this method is effective only so long as the window remains unbroken, it is better to nail a sheet of three-ply over the light.

All doors through which light is likely to show outside should be fitted with a "light-trap" of heavy curtaining on similar lines to the hanging curtain used to form an air-lock (see page 37).

Internal lighting should also receive attention. Electric bulbs of smaller power or of blue light type can be substituted for existing ones, and lights can be so shaded as to throw the light only in the direction required, e.g., downwards on to a table. To provide for obscuration of light in case of damage to part of a building, it is desirable for all lights to be controlled from one accessible point.

All occupants of premises must test their arrangements for obscuration as soon as completed by standing a short distance outside on a dark night and arranging with someone inside to switch the lights on and off. If it is possible to see the lights going on or off they are not sufficiently obscured.

Unless the necessary preparations are made to obscure lighting, the use of artificial lighting in any building is forbidden until action has been taken to comply with the Lighting Order. This means that factories whose lights are inadequately obscured must stop work, and private houses which have neglected preparations must at night be in complete darkness.

Penalties for failure to obscure lights are very heavy. They include three months' imprisonment or a £100 fine, or both; and imprisonment for two years or a £500 fine.

Portable Lights used by A.R.P. and other Essential Services. These must be effectively screened.

Pedestrians and Cyclists.

Hand torches may be used by pedestrians, provided the light projects downwards and is dimmed by putting two sheets of tissue

paper over the bulb. A pedestrian may use the torch to make his presence known (e.g., when crossing a road), but he must not shine the light directly on drivers of vehicles. After an air raid warning has been given, torches must not be used until the "All Clear" has been sounded.

Cyclists must carry red rear lamps, hooded and dimmed so that no light is thrown directly upwards and no appreciable light is thrown on the ground. When a raid is sounded, cycles must be taken off the road. **but not taken into a public shelter.**

Motor Vehicle Lights.

Offside headlights on motor vehicles may not be used. Nearside headlamps may be used only if they are screened by the officially devised mask in accordance with the official regulations obtainable at any Post Office. Bulbs in side lights must not exceed 7 watts. Bumper bars, front and rear, and the sides of running-boards, must be painted white. Cars without bumper bars must be painted white on front and rear mudguards.

The painting of white lines on roads and of white marks on kerbs, traffic pillars, etc., helps the movement of traffic, but **motorists should not use their cars between sunset and sunrise unless it is absolutely necessary.**

Motorists and Air Raid Warnings.

Motorists must leave their cars if an air raid warning is sounded, and seek shelter. Cars should be parked close to the nearside kerb, preferably in a side road, so as to keep the main roads clear. Alternatively, the car can be placed in a garage or car park. After sunset the side and rear lights of any cars in streets or roads must be left on. Valuables should be taken from any car that is left unattended and the doors must be left unlocked.

WARNING !

Take your gas mask wherever you go.

Keep off the streets if possible.

Do not crowd together in public places.

Carry an identity label on your person (not in a lady's handbag).

Learn the meaning of the Air Raid Warning Signals

MEDICAL SERVICES

The nation's medical services (First Aid Services, Ambulance Services and Hospitals) are controlled for A.R.P. purposes by the Ministry of Health.

First Aid Parties and Posts.

The personnel of First Aid Parties and Posts is recruited and trained by the scheme-making authority, usually the County Council or County Borough Council, though use is often made of the British Red Cross Society, St. John Ambulance Association, St. Andrew's Ambulance Association, and similar bodies.

The actual work of collecting and bringing in casualties in emergency will be the work of **First Aid Parties**, each of four men, who will operate from **First Aid Parties' Depots** and be so distributed in a given area as to be available for quick despatch to any place where casualties have occurred. Their duty is to give first aid on the spot, and to send the patients either to a First Aid Post or to a hospital, as may be necessary.

These First Aid Parties will work in conjunction with ambulances supplied from centralised **Ambulance Depots**, and may also have at their disposal privately owned cars with volunteer drivers.

First Aid Parties are equipped with protective clothing, respirators, first aid pouches, stretchers, supplies of civilian respirators (for persons whose respirators are damaged or mislaid) and a haversack containing additional First Aid essentials.

In all areas a number of **First Aid Posts** have been established to attend to casualties, including gas casualties, **as near as possible to the place where they occur** before they are allowed to go home. Those found to be more seriously injured than was at first thought will be sent on to hospital.

Small hospitals, clinics, health centres, etc., have been converted into F.A. Posts, and mobile F.A. Post units will operate in country districts.

Each First Aid Post has at least one doctor in attendance, and facilities for cleansing and for rendering first aid to casualties **of both sexes**. It is equipped to deal with three types of cases :

- (a) Those who are wounded and/or gassed but not contaminated ;
- (b) those who are wounded and/or gassed as well as contaminated ; and
- (c) those whose skin or clothing has been contaminated with liquid gas, but have no injury.

They will not deal with severely wounded or lung-irritant cases ; these must go on stretchers **direct to hospital**.

As far as possible, the First Aid Posts and Depots are located in existing buildings that can be made proof against gas, blast and splinters. They have facilities for cleansing, and, if necessary, for feeding and sleeping the First Aiders. In many places, the Posts and

Depots have been combined and, wherever it is possible, the personnel (particularly of First Aid Parties) must be duplicated to provide for the possible thinning of ranks by casualties.

It is desirable that a proportion (about 20%) of all the first aid personnel should be held in reserve for allocation wherever required in emergency.

Institutions and large business houses, railway companies, etc., should also provide private first aid facilities in addition to those provided officially for the general public.

First Aid Points.

In rural areas, the above first aid services are supplemented by **First Aid Points**, established at private houses, offices, etc., where patients can be collected for treatment by a Mobile First Aid Unit or for transmission to hospital.

Cleansing Stations.

In some towns separate **Cleansing Stations** have been established by the conversion of existing buildings such as garages, factories or public baths. Each Station is equipped with undressing rooms, showers, baths, etc., for the prompt treatment of persons contaminated by blister gas, and with cupboards or lockers for the workers' clothing and for protective clothing, etc.

The main features of a Cleansing Station are illustrated in Fig. 5. The layout can, of course, be varied as necessary to suit the building and local conditions. All walls and floors must be covered with material that is quickly and easily decontaminated, e.g., glazed tiles or glass.

Members of A.R.P. services who have to work in the open will, if necessary, be cleansed at these Stations as soon as they come off duty.

Cleansing Stations will be available for members of the public as well as for the A.R.P. Services. Facilities will also be available at all hospitals for the treatment of serious gas casualties.

Casualty Receiving Hospitals.

All hospitals have been cleared of cases that could safely be moved, and are available for the temporary admission of the more serious types of air raid casualty. They have been staffed with trained nursing and medical staffs, and are usually equipped with facilities for the treatment of injured or sick persons affected by blister gases.

Base Hospitals.

From the Receiving Hospitals casualties will be transferred to **Base Hospitals**, situated in country districts where the liability to

air attack is not so great. Places not ordinarily used as casualty hospitals, such as Mental Institutions and Public Assistance Institutions, are being used for this purpose, and their accommodation has been increased both by putting extra beds in rooms not ordinarily used as wards and by establishing new wards in wooden huts.

VETERINARY SERVICES

These will advise farmers and other keepers of animals on the best methods of protection and of dealing with injuries from high explosives or gases. They will be responsible also for the human-slaughtering of animals who are seriously injured or gas poisoned.

SALVAGE AND REPAIR SERVICES

Fire Fighting Services.

In all urban areas Auxiliary Fire Stations have been established as necessary, and the ordinary fire fighting appliances have been augmented by small, highly mobile and powerful pumps drawn by cars or lorries. These will patrol districts at frequent intervals after an air raid warning has been given so that delay in attacking fires will be reduced to a minimum, and **Lookout Posts** have been established to direct pumps to the scene of the fires.

The Fire Brigade Services work directly under the Home Office independently of other A.R.P. Services. For emergency, these services are supplemented by the **Auxiliary Fire Service** and the **Fire Brigade Reserve**. Men on the Reserve perform the whole-time, full duties of a fireman. Men and women of the A.F.S. are trained to act as **fire patrols**, to relieve the regular firemen, and to undertake telephone and messenger duties, full or part time. They wear the special **A.F.S. Badge**.

Rescue, Demolition and Repair Services.

Rescue parties (each of six or eight men under a skilled foreman) will work in conjunction with First Aid Parties to undertake the difficult and dangerous task of rescuing casualties trapped under damaged or collapsed buildings or other débris.

If possible, the same personnel will deal with the demolition or shoring up of weakened buildings, with the clearance and repair of blocked or damaged roads, with the repairing of reservoirs, etc.

Damage to essential public services (gas, electricity, telephone, water and sewers) will be attended to by Repair Gangs from the utility undertakings concerned, but the work of these must be carefully co-ordinated with that of the Rescue and Demolition parties.

Decontamination Services.

The highly important and dangerous work of decontaminating buildings, materials, areas, roads, vehicles, etc., will be undertaken by Decontamination Squads of six men each, working from a central Decontamination Depot, suitably equipped for the cleansing of the decontamination personnel themselves. There should be six depots each of two squads for about 100,000 population, and, as the men concerned will have to work in full protective clothing, they must necessarily be of good physique and have a thorough training in their duties. Full equipment will be provided. Large undertakings will provide their own Decontamination Staffs.

Decontamination services have to work in the closest co-operation with other services, because decontamination of structures or areas affected by blister gas must be completed before demolition work or service repairs can be carried out.

ANCILLARY SERVICES

Records, Stores, etc.

At every First Aid Post and hospital, clerical staffs will be provided to maintain records and to safeguard all clothing and valuables belonging to patients admitted for treatment.

Clerks and Storekeepers, chiefly men over 45 and women, will perform the great variety of clerical and recording work necessary in various other branches of the A.R.P. organisation.

INTELLIGENCE SERVICES

The Report Centre or Central Control Room.

This is the "brains" of the local A.R.P. organisation in war time. Here all messages (from Air Raid Wardens, Police, Fire Patrols, etc.) regarding air raid damage will be received and acted upon with the **minimum** delay by the calling of the necessary services to the scene of trouble, and will be subsequently collated, summarised, and tabulated for the information of the controlling officers and the Government on such matters as the local situation, number of casualties and local property destroyed.

With a view to future confirmation or collation, messages from the Report Centre to the required service will be recorded in writing before being sent by telephone or messenger.

In emergency, the telephone system to the Report Centres is bound to be overloaded. Telephone messages to the Report Centre must, therefore, be reduced to a minimum, and the public instructed to pass their messages to the nearest air raid warden or policeman, and not to transmit them direct by telephone.

The Report organisation must, in any event, be duplicated, and be so arranged that it can function by cycle and motor cycle, messengers and runners if the telephone system breaks down. The police wireless system is also being developed for A.R.P. purposes.

Telephone messages to the Report Centre can be made from private telephones, telephone boxes, police boxes, or from fire alarms.

The Headquarters of each A.R.P. service will look to the Report Centre for information, e.g., that certain roads are blocked or bridges destroyed. The Report Centre must, therefore, have all the necessary information kept fully up to the minute, and recorded in immediately visible form by flag signals, etc., on maps of the local area.

As soon as each service has completed its work at a given place, it should advise the Report Centre accordingly, adding, if necessary, any important information on the general situation.

Staffs at Report Centres require regular training and practice in the receipt, quick recording, and transmitting of messages. Messengers, too, require to be fully instructed on the layout of the district, the local A.R.P. organisation and on the method of transmitting messages verbally, especially by telephone.

Reports of any kind should be in brief telegram form, but never in code.

Report Centre Staffs, Messengers, etc.

At the Report Centres, capable men and women will perform the highly important duties of receiving reports of damage and casualties, and of calling out necessary services. Messengers, either youths of 16-18 or men of 30 and over, will carry messages by cycle, motor cycle, or on foot.

Gas Detection Service.

In general, the identification of the gas used in an attack will be the duty of the Warden. As it is of vital importance, however, that the medical services have certain knowledge on this point, particularly if there is a mixture of gases, Gas Detection Services—squads of expert chemists, etc.—will have the duty of visiting the scene of damage and of confirming to Report H.Q. as soon as possible the nature of the gases used.

AIR RAID WARNINGS

To give the public and services warning of impending raids, Britain is divided according to the telephone organisation into 100 comparatively small **Warning Districts**, each based on a Group Telephone Exchange. The districts do not coincide with the local government boundaries, so that a county may have different parts in two or more Warning Districts.

The warnings will be issued in turn to the Group Telephone Exchange of each Warning District threatened by a raid, and the warning will then be automatically distributed by telephone to recipients on pre-arranged **Local Warning Lists** (one **Special**, one **Action**) prepared by the Chief Constables.

The **Special Warning List** includes local A.R.P. Headquarters, Police and Fire Headquarters, First Aid Depots and Posts, public utility undertakings, blast furnaces (for damping down), and factories of national importance. The **Action List** includes, in addition, operators of Public Warning Signals.

GENERAL SCHEME OF AIR RAID WARNINGS

Preliminary Caution

Telephone Code:
"Yellow"
(Confidential)

Confidential message to Government Departments and recipients on the local **Special Warning List**, that a raid on the district is likely in about fifteen minutes. A.R.P. services will take essential action as quietly and unobtrusively as possible, but no public warning will be given in case there is no raid.

Cancel Caution

Telephone Code:
"White"
(Confidential)

If there is no raid, a message cancelling the **Preliminary Caution** will be sent to those who received it. Wardens will then be released from duty.

Action Warning

Telephone Code:
"Red"
(Made Public)

Recipients on the **Special List** and the additional recipients on the **Action List** are warned that a raid is possible in their district in 5-10 minutes. The Local Authorities concerned then issue warning signals to the public by hooter or sirens with a fluctuating or "warbling" or intermittent blast, the whole signal lasting two minutes.

REPEATED ACTION WARNING—All Wardens and police reinforce the general warning by sharp blasts of the whistle in their own Sectors.

Public take necessary precautions and go to shelters; all traffic stops, and (if at night) all lights are put out.

Local Gas Warning (To Public)

Wardens (or police) sound hand rattles continuously in any streets or areas affected by gas. An immediate report of the presence of gas in the locality is sent from the post to the Report Centre.

The Local Gas Warning must not be sounded more widely than is necessary, otherwise public and services will be unduly disorganised

Raiders Passed Telephone Code "Green" (Made Public)

Following a message from the National Warning Centre that raiders have left the district, the Local Authorities concerned issue a continuous steady-pitched blast on sirens for two minutes to advise public that raiders have left the district, or that a raid is no longer imminent.

This signal does not mean that any local gas danger is removed. Freedom from gas is indicated by the

Local "All Clear" (To Public)

CANCEL GAS WARNING. Wardens, on instructions from their Chief or Head Warden, ring handbells through streets of their sector when all gas danger in that sector is removed.

Group Warden or Head Warden advises Report Centre.

If there has been no gas, the handbells are rung to reinforce the "Raiders Passed" signal.

Every householder and every Air Raid Warden must at once make himself acquainted with the exact details of the scheme of air raid warnings to be operated in his home district, and, if he works away from home, with the system to be operated near his place of business

A.R.P. IN INDUSTRY

The Civil Defence Act, 1939, has brought into operation highly important provisions concerning air raid precautions in factories, mines, and commercial buildings (offices).

Shelter for Employees.

Employers of more than fifty people in certain areas **specified from time to time by the authorities**¹ (and proprietors of certain factory premises **outside the areas**), have to provide for all their employees adequate shelter conforming to the standard laid down in the Code.² The anticipated cost is about £4 per head, and all employers who are **compelled to provide shelter** will be entitled to a grant equivalent to the standard rate of income tax, in respect of reasonable capital expenditure on shelters conforming to the Code (see below).

A.R.P. Organisation and Training in Business Premises.

In all businesses employing more than thirty persons, **wherever situated**, employers must organise an A.R.P. scheme, under responsible control, to ensure (a) that employees know what to do in an air raid ; and (b) that an adequate number of them are trained and equipped in first aid, fire-fighting, and anti-gas measures.

Each business must appoint an A.R.P. organiser to supervise this work, and, *inter alia*, to organise and train the personnel through control officers in charge of each of the services ; to organise effective warning and intercommunication systems ; to ensure that every employee knows to which shelter to go, and that adequate evacuation and directional notices are posted up in the premises ; to see that all employees have their respirators always at hand in emergency ; to establish a central Report Centre for the premises ; to obtain and allot and store all the necessary A.R.P. equipment ; to plan regular A.R.P. practices, and to take control in emergency. An adequate number of Air Raid Wardens, under the control of a Senior Warden, will supervise evacuation of the workpeople to shelters, and function generally to prevent panic.

In large establishments, about 10 per cent of all employees should be trained for internal A.R.P. duties ; in smaller establishments the proportion can be reduced by the organisation of "General Utility A.R.P. Squads", though the fire squad must be separate.

A.R.P. workers in business firms may enrol for part-time A.R.P. service with their own local authorities, but must advise those authorities clearly of the daytime demand on their services.

Persons in "reserved occupations" under the National Service Scheme are eligible for A.R.P. duties at their place of business.

¹ See the *List of Specified Areas under the Civil Defence Act* (H.M.S.O., 2d.).

² *Code of Air Raid Shelters for Persons Working in Factories and Commercial Buildings* (H.M.S.O., 6d.).

Equipment.

Practically all business A.R.P. workers require civilian duty respirators, protective clothing, and steel helmets. In addition, the first-aiders require first-aid equipment and stretchers (in large premises); the fire squads require necessary fire-fighting equipment, according to the size of the undertaking; whilst rescue parties and decontamination squads (if any) also require specialised equipment for their duties.

Obscuration of Light and Glare.

Those responsible for factory premises, mines, and public utility undertakings wherever situated, are required forthwith to prepare to obscure all lighting and glare (e.g., of blast furnaces, coke ovens, and burning refuse dumps near mines), so as to ensure a complete black-out throughout the country.¹

Administration of Industrial A.R.P.

The foregoing provisions are administered in the case of (a) offices, by the local authorities; (b) factories, by factory inspectors; and (c) mines and quarries, by mines inspectors.

By 13th October, 1939, all employers of more than 50 people in specified areas must report on the shelter provided for employees, and all employers, wherever situated, must report by 13th August, 1939, on the steps taken to train and equip their personnel. Special provisions apply to public utility undertakings.

The foregoing provisions do not apply to buildings wholly or mainly occupied as a school, college, hotel, restaurant, club, hospital, nursing-home, or place of public entertainment or amusement.

Grants and Income Tax Allowances in Respect of Expenditure.

Grants equivalent to the standard rate of income tax in 1939-40 will be paid to all employers in specified areas in respect of expenditure on employees' shelters which conform to standard.

Expenditure on A.R.P. equipment, fixtures, and fittings (e.g., steel window shutters and gas-proof doors), and expenditure on obscuring light, as well as wear and tear allowance in respect of A.R.P. plant and machinery (e.g., filtration plant and fire appliances) is admissible as a deduction for income tax purposes in computing trading profits. Expenditure on alterations to the main structure of premises is not deductible, but expenditure on simply constructed trenches or sandbag ramparts or basement strutting is allowable.

Grants may be made by the authorities up to one half of the expenditure incurred on the prevention or screening of glare, and on the provision of camouflage.

To qualify for the foregoing grants, the relative work must have been effectively put in hand before 30th September, 1939.

¹ See "War-time Lighting Restrictions for Industrial and Commercial Premises" (H.M.S.O., 2d.).

DUTIES OF AN AIR RAID WARDEN

The Air Raid Warden¹ occupies a most important place in the general scheme of Air Raid Precautions. He should be a responsible and reliable member of the public, free from physical or temperamental disability, whose duty is to advise and instruct his neighbours how to protect themselves against injury from air attack, and to this end to fit them with the necessary respirators, and make known the precautions available to safeguard life and property.

In war time the warden is expected to act with courage and presence of mind—(a) as a leader and helper of the people in his immediate neighbourhood, and (b) as a link between such people and the local A.R.P. services.

Further, he is expected to carry out with speed, accuracy, coolness, and efficiency the important duties described below. He is placed, as it were, in the front line of our civilian defence scheme, and he is responsible for reporting to Headquarters any air raid damage and casualties in his Sector, so that necessary help can be sent forthwith.

To carry out his duties efficiently in emergency, the Warden must get the full co-operation of all householders in his Sector. Whilst his duty is to advise and to assist, he must get his neighbours to learn how to look after themselves.

He must, therefore, inform them of his address (by special cards provided for this purpose), so that they can come to him for advice and assistance, and so that they can, in the event of a raid, warn him immediately of any damage or casualties in or near their homes, especially in secluded gardens, areas, etc., which the Warden cannot ordinarily see during his patrol.

Every Air Raid Warden should gather round him a body of staunch persons who can be relied on for assistance in emergency, inviting as many as possible to enrol and qualify as Air Raid Wardens.

As a token of his authority, the Air Raid Warden is supplied with a **Card of Appointment**, signed by the A.R.P. Officer or Clerk to the Local Authority, and with a silver "A.R.P. Badge" and a special **Armlet**. He is also supplied with a civilian respirator (for use when he is not on duty) and with a steel helmet, both of which he keeps at home. Other equipment with which he is supplied when on duty (Civilian Duty respirator, whistle, rattle, handbell, etc.) will usually be kept at his Post.

The Warden's Card of Appointment not only proves his authority to householders and others whom he may visit in the course of his duties, but also enables him to offer his services as a Warden if he is away from his own Sector. **An A.R.P. Badge is no evidence of authority to act as a Warden.**

¹ For simplicity the masculine is retained in this booklet, although women as well as men can be Wardens. Men should be over 30 years of age, and not be required for war service elsewhere.

Wardens' Expenses.

Any Warden who incurs expenses in connection with his duties should apply for reimbursement to the Local Authority, as it is the intention of the Government that these volunteers shall not be required to incur any out-of-pocket expenses in connection with their work.

WHAT AN AIR RAID WARDEN MUST KNOW

1. The contents of the official booklets "*The Protection of your Home against Air Raids*".¹ and "*The Duties of Air Raid Wardens*".² so that he can advise and help the householders in his Sector concerning the dangers of air raids and the available means of protection
2. The chief characteristics of war gases, including methods of detection and of protection against them.
3. The dangers of incendiary bombs, and the methods of dealing with them and with any resultant fires.
4. Elementary methods of protection against H.E. and government arrangements for providing shelters for householders, pedestrians, etc. (see page 60).
5. How to fit Respirators on himself and the public; the local arrangements for Respirator distribution; the maintenance of the relative records and of the Householders' Register.
6. What equipment he requires, where he can obtain it, what equipment is maintained at his Post, and how all such equipment, as well as equipment issued to the public, is kept in a proper state of cleanliness and efficiency.
7. The main features of the local A.R.P. organisation, including the scheme of local Air Raid warnings, the location of the local A.R.P. services, the names, addresses and telephone numbers of the A.R.P. offices and officers, and of the Chief Warden and Deputy Warden, the address and telephone number of the Report Centre, the relations of local Wardens with police and public, the local Auxiliary Fire Service Organisation; and any special local arrangements for evacuating people from unsafe areas.
8. **Concerning his Sector:** Its extent and the names of all streets and roads therein; the names, addresses and telephone numbers of his Group Warden, Senior Warden, and Sector Wardens, as well as of other stout-hearted people who might help in emergency; the addresses of invalids and infirm people who might require special assistance; the position of the nearest Respirator Distributing Centres, Respirator Stores, Cleansing Stations, Decontamination Centres, First Aid Posts, Ambulance Depots, and Hospitals; the location of all water hydrants and other water supplies (ponds, wells, etc.), of police boxes and telephones; the addresses of all chemists, nurses, doctors and veterinary surgeons; the position of all public shelters, other places of safety, and places of special danger, such as petrol stores and timber yards; the situation of local means of cutting off escaping water and gas; the fire-fighting arrangements in his Sector; the location of any hand fire-fighting equipment—hand-pumps, extinguishers, etc.; the situation of neighbouring Wardens' Posts. (See pages 85-87.) **All such items must be recorded in the blank spaces provided in Handbook No. 8.**
9. The elements of first aid for gas and other injuries.
10. How to recognise and report breakages of water, gas, or sewer pipes, telephone and electricity cables, etc.

¹ H.M. Stationery Office, free.

² Handbook No. 8, H.M. Stationery Office, 2d.

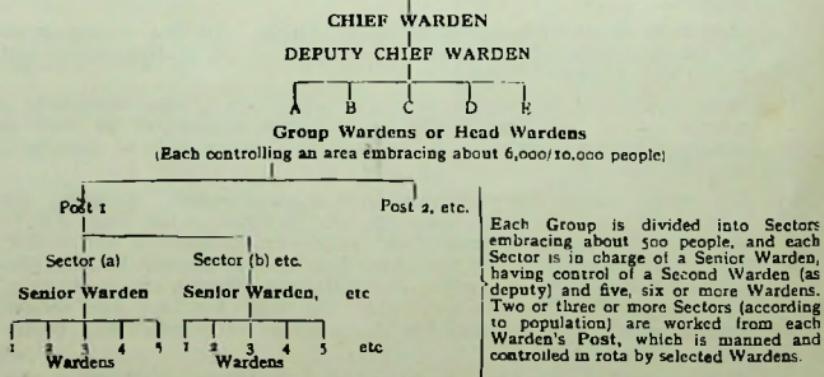
11. How to make clear, concise, and accurate reports concerning Air Raid Damage, i.e., gas, H.E. and incendiary bombs and fires, and the place to which such Reports must be sent (see below).
 12. The arrangement of patrols in his Sector, and the use of Sector and other Local Maps.
 13. How to co-operate in emergency with the local Fire Services, Fire Patrols, and other A.R.P. Services.
 14. How food should be protected from contamination so that he can properly advise householders and traders in his Sector.

AIR RAID WARDENS' ORGANISATION

All Air Raid Wardens in a town of 30,000 to 150,000 people are organised as shown in the annexed chart, the organisation in small towns and villages being reduced and varied as necessary.

AIR RAID PRECAUTIONS OFFICER

e.g., Chief Constable or Town Clerk).



Groups are distinguished by capital letters (A, B, C, etc.); Posts by numbers (1, 2, 3, etc.) and Sectors by small letters (a, b, c, etc.). Hence Sector A1 (a) means Sector (a) of Post 1, Group A.

Towns of 150,000 or more people are split up into Divisions or Districts, each in charge of a Divisional Warden or District Warden controlling a number of Groups, and responsible to the Chief Warden.

In densely populated areas, Posts are situated about 500 or 600 yards apart, with a maximum of 10 posts per square mile. Less dense areas have fewer posts, but no built-up area should be more than a half-mile walk from a Post.

Tenements, blocks of flats, business premises, etc., containing more than 100 people have their own special wardens or "guards" who co-operate with the street wardens. Sectors containing such premises may, therefore, embrace more than 500 people.

Although Wardens may be organised under the general control of the Chief Officer of Police as Air Raid Precautions Officer, they are an entirely separate corps under their own Chief Warden and do not

form part of the police or special constabulary. Whilst, therefore, wardens are expected to and must of necessity work in close co-operation with the Police, they are not subject to control by or to orders from ordinary members of the police force.

Organisations in Rural Areas

The A.R.P. organisation in rural areas is much less detailed and elaborate than that in large towns. Rural areas do not contain such specific targets for bombing as are found in urban districts, and, as their density of population is low, a larger number of bombs would be required to kill or injure a given number of people in a rural area than in an urban district. Further, small villages are most unlikely to be singled out for attack from the air : they are likely to be damaged only by bombs dropped at random.

To establish a full complement of services in a rural area would, therefore, be a wasteful policy. The equipment involved could be far more profitably used in larger centres of population.

Hence, rural areas are provided with a first aid point in each village, and the Wardens (about 3 per 500 people) work from their own homes from one centrally situated post. In the unlikely event of a serious incident, the necessary additional services will be summoned from the nearest large town.

Chief Wardens, Divisional Wardens, and Head Wardens.

The Chief Warden, Divisional Wardens, and Head (or Group) Wardens are responsible for general policy, for the recruitment, training and exercising of Wardens, for the allocation of Posts, for keeping all Wardens fully informed on latest developments in A.R.P. both locally and generally, and for the maintenance of the interest and efficiency of the Wardens under their control.

The Chief Warden will have under his direct control a reserve of Wardens to reinforce areas as required.

Chief Wardens and Divisional Wardens controlling more than four Groups should have a paid, full-time assistant whose duty it is to foster the efficiency of the Wardens and undertake the routine duties of training and organisation.

Group Wardens should assemble all their Wardens at least once a month for instruction, discussion, and the promotion of their general interest and efficiency.

At the Group meetings the Senior Wardens should report on their respective Posts, their equipment, gas mask distribution, position of householders' cards, etc., whilst Group Wardens should utilise such meetings to keep their Wardens fully informed respecting latest developments in A.R.P., and especially in the local organisation.

The object of the Group Wardens should be to maintain a high standard of discipline, compatible with the voluntary organisation, to deal fairly with all criticisms and complaints, and to give patient consideration to suggestions put forward by any of the Wardens.

Senior Wardens.

Senior Wardens should be selected with extreme care. They should be alert, active, capable men with some intelligence, who can be relied upon to act quickly and efficiently in emergency, and to control and regularly exercise the Wardens attached to their Sectors.

Senior Wardens should meet their Wardens, if possible, every week, for a short period to consider matters relative to the Sector (e.g., householders' removals, new points of danger, and other changes in the Sector details), to **undertake minor exercises** (particularly in reporting), and generally to promote the interest and efficiency of the Sector Wardens.

The Duties of a Senior Warden are :

1. To supervise his Sector, and to give practical training, advice, and guidance to the Sector Wardens with a view to promoting their interest and efficiency.
2. To allocate duties and patrols in the Sector.
3. To arrange rotas and shifts of Wardens. Wardens who have to carry out their normal work during the daytime must not be deprived of more of their rest than is absolutely essential.
4. To keep up-to-date the distribution of respirators, and all records and information relating to the Sector, viz., respirator distribution cards, position of First Aid points, doctors, chemists, fire hydrants, places of danger, places of shelter, etc.
5. To prepare a Sector Map and, if possible, issue copies to his Wardens.
6. To see that householders are notified (by householders' cards) of the addresses of Wardens.
7. To get into touch with any newly-enrolled Wardens, and to instruct them fully in their duties.
8. To safeguard all equipment in the Sector.
9. To maintain contact with special Posts in large offices, factories, shops, etc., in their Sectors.
10. To keep the Head Warden fully informed respecting conditions in the Sector, efficiency of Wardens, etc. Cases of inefficiency or lack of interest on the part of Wardens should be reported.
11. To ensure that the Sector is adequately patrolled when the "action warning" is given.
12. To arrange regular meetings of the Sector Wardens to discuss with them matters specially affecting the Sector, to keep them fully informed of developments in the general and local A.R.P. services, and to exercise the Wardens regularly in writing and telephoning reports.
13. To ensure that the Sector Wardens keep their A.R.P. knowledge and respirator drill thoroughly up-to-date.
14. To maintain close contact with Senior Wardens in adjoining Sectors.
15. To afford all householders in the Sector sufficient information to enable them to look after themselves as much as possible in emergency, and to co-operate with the Wardens' Organisation in the interest of general safety.

If you are a Senior Warden, **MAKE IT YOUR OWN JOB** to see that all people in your Sector are properly fitted with respirators and that they know how to use them. See that all your householders know how to make a sound Refuge Room or some other form of shelter.

See that they know how to deal with incendiary bombs. Encourage them to come to you and your Wardens for advice and assistance. **Valuable lives may depend on YOUR efficiency NOW.**

Wardens' Equipment and Wardens' Post.

Each Warden, on completion of his training, is issued with an armlet, badge, gate sign ("Air Raid Warden"), and helmet, all of which he keeps and safeguards himself. Like other civilians, he has a civilian respirator for use **when not on duty**.

The other equipment required by Wardens will ordinarily be kept at the Post, viz. :

Civilian Duty Respirators (one for each Warden, marked with his name). Whistles, rattles, handbells, torches, light protective clothing (anti-gas suits, gloves, and curtains), eye shields and rubber boots, and Report Forms.

First aid outfit, including bleach cream.

In addition, each Post should have some fire-fighting equipment, appliances for dealing with incendiary bombs, and a supply of each size of Civilian Respirator for issue to people who have damaged or mislaid theirs, or to people who are caught in the streets without respirators.

The full-time Wardens at the Post (**Post Wardens**), if any, are responsible for safeguarding this equipment and keeping it readily available and efficient for use in emergency; otherwise the duty should be delegated to one of the Senior Wardens attached to the Post, who should be appointed as Post Supervisor.

The Wardens' Post is responsible for communicating to the Report Centre all information concerning air raid damage in the Sectors attached to it. The Post **must always be kept manned in wartime** and a rota of wardens must be arranged by the Head Warden for this purpose. Every Post should also be supplied with a rota of messengers, probably from the Scout organisations.

Every Post is provided with blast- and splinter-proof protection for the wardens and messengers serving it, and must have attached to it, or nearby, a store adequate to take all equipment for the Wardens attached to the Post. In many places the Posts are being specially built. In others, the Post may be established in a conveniently situated house, or in a school, garage, outbuilding, or part of an existing public building.

WARDENS' REPORTS

In every town there is a Report Centre or **Central Control Room** to which Wardens must send immediate information respecting the fall of bombs and presence of gas. The Reports, especially when given over the telephone, must be clear, quick, concise, and accurate, **worded in the form of a telegram**. They must be recorded in the duplicate carbon Report Book which is supplied to each Warden and to each Post.

SPECIMEN WARDEN'S REPORT FORM

AIR RAID DAMAGE. Warden's Post No. 00

Position of occurrence.....

Type of bombs—H.E./Incendiary/Poison Gas/Smoke.....

Approx. No. of Casualties (if any trapped under wreckage, say so).....

If fire, say so.....

Damage to mains—Water/Gas/Overhead Electric Cables/Sewers/Telephones.....

Names of roads blocked.....

Position of any unexploded bombs.....

Time :.....

Services already on the spot or coming.....

Remarks

ORIGINAL/DUPLICATE. To be used when report is sent by messenger.
Delete whichever is inapplicable.

Whilst a raid is still in progress the fall of an H.E. or Incendiary bomb is NOT to be reported if there are no casualties and little or no damage, or damage which does not require early repair. A fire need not be reported if under control or unlikely to spread.

SPECIMEN TELEPHONED REPORT

"AIR RAID DAMAGE. Warden's Post C5. Acme Hosiery Factory, Highfield Road. H.E. and Incendiary Bombs. Seventeen casualties and others under wreckage. Serious fire. Water and gas mains damaged. Highfield Road partly blocked. 17.30 hours. Fire patrols 17-19 present. Front of works wrecked. Message ends."

Speed in making the Report is vital, casualties, and especially blister gas casualties, must receive treatment as quickly as possible, and unless a surface contaminated with blister gas is treated immediately the treatment will be ineffective, and special action will have to be taken to deal with the decontamination.

Correct information is essential, otherwise vital services may be called out unnecessarily and prevented from saving lives elsewhere.

Damage to mains (gas, sewers, etc.) should be reported only when **important public street mains are affected**, and not when the damage is on private premises or property.

As soon as the Warden has jotted down on his Report Form brief details of the damage, etc., he must at once **make a report to his Post**, either personally (if he is nearby) or by sending a messenger, or by telephone (from the nearest private telephone, 'phone box, or police box). The Post then informs the **Report Centre**, which **alone is authorised to instruct the required services** to proceed to the scene of the trouble.

If, in emergency, the telephone cannot be used for messages, and reports from the Posts to the Report Centre have to be sent by messenger, the messages must be sent in duplicate by separate messengers.

Only in exceptional cases should Reports go direct to a service instead of first to the Report Centre. If reports are sent direct, the service may be engaged elsewhere, or may be out of action. The Report Centre, however, is in direct touch with all Posts and services, so if one is not available, another will be sent. Moreover, the Report Centre must have immediate first-hand information of all damage and of all calls on the services at its disposal.

Hence, a Warden should communicate direct with a service only if he can obviously do so more quickly and more directly than through the Report Centre, e.g., if he happens to be within a few yards of a patrolling First Aid Party or Fire Patrol, or when he applies to a nearby police station or patrolling policeman for help in controlling panic or diverting traffic.

Wherever a service is so called the Report Centre must be informed as quickly as possible. In reporting a "Service already on the spot" some means of identification should be given (e.g., "Fire Patrol 1").

WHAT YOU DO AS AN AIR RAID WARDEN IN EMERGENCY

When on duty as an Air Raid Warden in war time, you will wear the special warden's uniform, a civilian duty respirator, a steel helmet (with an anti-gas curtain) and an eye shield together with your badge and armlet. You also carry a whistle (for giving local warning of air raids) and an electric torch. You will have available at the Post for use as required light anti-gas clothing, a rattle for giving local warning of the presence of gas, and a handbell for giving the local "All Clear" signal.

When an air raid warning is sounded, at once get to your Sector and go on duty there if you can possibly do so. If you are too far away from your own Sector, offer your assistance where you work or at the nearest Wardens' Post. You should, of course, have your badge and authority card with you.

You take up patrol duty in the part of the Sector allotted to you, and there give the local warning by sharp blasts on your whistle.

Advise all persons in the open to go to their homes or to the nearest public shelter or other refuge, and, at night, ensure that all lights in your Sector are properly screened or put out. See that vehicles which stop draw up near the kerb, preferably in a side street, and that any horses are tied up securely where they will not be a nuisance or a danger and where they will receive the maximum available protection, but do not tie them up to lamp posts or railings. Then send the occupants of the vehicles to the nearest shelter.

When the raid seems imminent, e.g., when you hear gunfire, take shelter in your Post or in a prearranged look-out Post where other

Wardens can find you. You must not unduly expose yourself to danger, and you will, of course, seek the best available cover whilst bombs are actually falling. **If damage occurs, act promptly and efficiently.** If gas bombs are dropped, get to your Post for a rattle and protective clothing.

Take care to have your respirator in the "alert" position, to keep to the windward of any bomb craters or liquid gas splashes, to keep away from dangerous collapsing walls or structures, and to avoid contact with any buildings, débris, or materials likely to be contaminated. If there are people about, see that they do likewise.

Be on the look-out for signs of gas spray. Warn all your householders not to look upwards when planes are overhead, and take care not to do so yourself.

Keep in contact with Wardens in other Sectors and Wardens in other groups. Be prepared to help them if necessary, and to call on them to help you if you need assistance.

ACTION ON AIR RAID DAMAGE

In emergency, you will have to use a great deal of common sense in deciding what to do. **It is impossible to lay down rules that will apply to every case.** So consider the position quickly, but carefully, and act promptly.

Your actions should be ordered so as to SAVE LIFE FIRST, so :

1. **Succour any urgent casualties** if you can, e.g., blister gas in eyes.
2. **Prevent other casualties**, e.g., by giving gas alarm, and keeping people away from collapsing buildings.
3. **Make a report** to your post.

If there is serious damage, danger or injury, at once call for help of other Wardens, police, special constables, etc., by several sharp blasts on your whistle, or by despatching a messenger to your Post.

You may have to decide whether to report to your Post for help or to render immediate assistance to casualties. **Act on the basis that your duty is to save life and injury in your Sector AS A WHOLE.** You must not delay getting an urgent report to headquarters which may save many lives, in order to try to help one or two individuals.

Again, you may have to decide which of two incidents to investigate first, e.g., a high explosive bomb at one end of the street, or a blister gas bomb at the other. Naturally, you will try to get help in any ways open to you by attracting the attention of other Wardens, calling out useful householders, and by advising your Post. Remembering that the H.E. bomb will have done its damage, that any rescue work will have to be done by specially equipped parties, and that the gas bomb will be only beginning its damage, you will probably decide

to investigate the gas bomb, and warn all people in its neighbourhood.

Watch out also for combinations of gases, or for gas and high explosive. A tear gas may be used to mask the more dangerous mustard or phosgene. **Only by being fully on the alert can you save trouble for yourself and others.**

Subject to your endeavour to save life first, get your report to your Post as quickly as you possibly can. On receiving your message, the Warden at your Post will immediately advise Report Headquarters so that the necessary help can be sent, whilst any spare Wardens at the Post will equip themselves with their protective clothing, respirators, whistles, rattles, first-aid equipment, and spare civilian respirators, and will at once proceed to the scene of the trouble.

WHEN YOU FIND GAS

1. **Don your respirator**, and sound your **rattle downwind**.
2. Identify the gas as quickly as possible.
3. If there are any dangerous casualties (e.g., with **blister gas** in the eyes or on their clothing), attend to them at once.
4. **Clear people out of any houses** that are badly affected, and direct them to alternative shelters.
5. Advise your Post, **indicating the direction of the wind**, so that Wardens in Sectors downwind can be warned.
6. If first-aid party has not arrived, do what you can for any casualties.
7. See that no panic-stricken people rush out into the street.
8. Pending the arrival of the decontamination squad, see that no unauthorised person enters the contaminated area.

Gas spreads downwind, so if you hear a rattle warning **from upwind**, move towards the sound, and give your rattle warning as soon as you detect gas.

If you hear a rattle warning **from downwind**, do nothing. **THE GAS ALARM MUST NOT BE SPREAD TOO FAR** and people unnecessarily alarmed.

INCENDIARY BOMBS: FIRE

1. **Warn any occupants** of a building on which a bomb has dropped.
2. If you can do so **without neglecting your general duties as a Warden**, help the occupants to deal with the burning bomb and any resultant fire.
3. If necessary call the Fire Patrol or Auxiliary Fire Service direct; otherwise report in the usual way.
4. If a **serious fire appears likely**, or if an important building (e.g., a hospital or gasworks) is threatened, report to your Post at once, so that the Report Centre can be advised, and the Fire Brigade called.
5. Otherwise advise your Post that fire has occurred, but is under control.
6. **Do what you can for casualties**, calling first-aid if necessary.

PANIC

Panic can develop into most serious proportions, and result in injury or loss of life. Hence:

1. Do what you can to calm and reassure people by personal advice and example.
2. If necessary, call directly for police help.

HIGH EXPLOSIVE DAMAGE

1. Clear people out of any seriously damaged building, keep them away from falling walls and débris, and direct them to some place of shelter.
2. Get a report to your Post.
3. Succour casualties if you can.
4. Get help to blockade the roads affected and to rope off craters.
5. See that any unexploded bombs are roped off, and the Report Centre advised. They will report to the military authorities.

DAMAGE TO SERVICE MAINS

Damage to gas, electricity, and water mains must be repaired by the specialised repair gangs organised by the relative company or local authority. You must, therefore, get a report of such damage via your Post to the Report Centre as quickly as you can, stating the exact position of the damage. Pending the arrival of the repair squad, you have important work to do, viz.:

Gas Mains.

Where the leak is serious, warn the occupants of neighbouring houses, and remove them to a place of safety. The stronger the wind, the wider the area of possible danger. Stop all traffic along the street, and warn all services. Because of the danger of explosion, keep all naked lights away from the affected areas.

If a main is on fire, there is no danger of explosion so long as the pressure is maintained from the works, and it can be left to burn until the gas-repair men arrive. Where there is a danger of the fire damaging surrounding property, however, smother the fire with earth or sand. Never attempt to beat out the fire with wet sacks, because that may fan the flames into pockets where there may be explosive mixtures of gas and air.

Damage to a service (e.g., domestic supply) gas pipe may possibly occur without damage to the main. In such a case, warn the occupants of the premises concerned, and of neighbouring premises; if necessary, and get them elsewhere to shelter.

You can stop a small leak in a service pipe by covering it with clay or soap. Also you can temporarily plug a broken service pipe with wood, and seal it with clay or soap. If the gas in the pipe is on fire,

smother the outlet with earth or sand, and then plug it. Where household pipes are damaged, cut off the supply of gas at the stopcock near the meter.

Electric Mains Cables.

You can do nothing to damaged electric cables, and you must leave them alone. Although a cable may be completely broken it may be alive with electricity, and highly dangerous. Anyone coming into contact with it might suffer serious injury or even death.

When a cable is on fire, leave it to burn if it will cause no other damage, but keep all people away from the spot, and warn all services that come along, especially the fire brigade if operating near at hand.

At once report a fire at an electricity sub-station to the local fire patrol or to the Report Centre. Do not attempt to put out the fire ; this is a specialised job for the fire brigade.

Casualty Contacting Live Cable.

You can safely remove a casualty who is in contact with a live cable, provided you take proper precautions. But take no action if you are in doubt about its safety, otherwise you may seriously injure yourself.

To remove the casualty, wrap one hand in a cap or in some other thick article of clothing that will act as an insulator. With this hand grasp the clothing of the casualty, and quickly pull him clear. Be careful not to grasp anything for support, such as an iron railing or gate or lamp post, as this will make a circuit to earth, and you may be seriously injured. If you are wearing rubber boots and take care that they insulate your body from the earth, and that you do not make contact with any other object, you can perform this action with safety. You can do so also if you are wearing leather boots, provided the ground is dry. If the ground is wet, and particularly if you stand in water with leather boots on, the operation will be dangerous.

Water Mains.

Damage to water mains gives rise to no danger to the public or to A.R.P. personnel, except for the danger of flooding of basements in which people are sheltering. You should know of any people in your area who are likely to be in such danger, and you must, of course, warn them to get away.

Damage may be to the water main itself, or to the service pipes leading from the main to premises and houses. If a main is smashed there will, of course, be a far larger rush of water than if only a service pipe is damaged. If a bomb crater speedily fills up with water, or if, after a bomb has dropped near by, you see water quickly welling up to the road surface, you should report smashing of the water main.

The husbanding of water supplies is a vital matter in war time. If a main bursts, however, you can do nothing to turn off the

water, because the valves can be operated only by the water service men. But if a service pipe is damaged between a house and the stopcock, you can shut off the supply to the house by turning off the stopcock. If water pipes are damaged in the house, cut off the supply at the cock or tap which is affixed to the pipe where it enters the house.

DIRECTING SERVICES

It is your job to direct fire patrols, first-aid parties, rescue parties, and other services to the place where they are required **by the shortest and safest route**. Warn them of the existence of collapsing buildings or of gas, and tell them of any casualties, invalids, or children who require special attention. Be ready also to transmit any messages or to render any other assistance required by the services.

SOUNDING THE "ALL CLEAR"

When you hear the "Raiders Passed" signal, you will give the "All Clear" in your Sector by **loudly ringing your handbell**. If gas has been used, however, you will not give the "All Clear" until your Senior or Head Warden gives you instructions to that effect when he is satisfied that there is no longer any local gas danger.

No one in your Sector must be allowed out until you are able to sound the "All Clear."

When there is damage in your Sector, you must remain on duty until all casualties have been removed, any fires put out, and every necessary action taken to safeguard the public from gas contamination, falling débris, etc. If there is no damage, wait on duty until you are relieved or released by your Senior Warden, who will receive the necessary instructions from Headquarters.

On being released from duty you must, if necessary, have your clothing removed and decontaminated, and your person cleansed at the nearest Cleansing Station. Otherwise you should return to your Post and leave your equipment there.

REMEMBER

(1) That **ECONOMY** of First Aid and Ambulance Services is **vital in a serious emergency**. Save such services if you can possibly do so.

(2) That contamination of an ambulance may put it out of service for several hours, a most serious matter in an emergency. Avoid this, if it is at all possible.

(3) To keep all contaminated cases well away from other people, and see that any contaminated clothing which is taken off is put in a place where it will not be of danger to others.

(4) To take care to see that you do not yourself become a casualty by getting your person or clothing contaminated with poison gas.

(5) To keep your Respirator in the "Alert" position, to put it on at once whenever it is necessary to do so, and to see that you always wear your protective clothing and gloves in handling blister gas cases or contaminated clothing or material.

HEAD WARDENS' RAID REPORT

As soon as possible after a raid, Head Wardens will collate information from each of their Posts (at which a log will be kept), and compile a full report of the incidents of each raid for the information of the Report Centre, Chief Warden, and A.R.P.O.

HINTS FOR WARDENS

1. **Know your A.R.P., know your Sector, know your people, know your fellow-wardens.**
2. Make it your own personal job to see that all the people in your Sector have properly fitted Respirators, and that they know how to use them. **Lives may depend on your efficiency NOW.**
3. Practise wearing your own Respirator for half an hour at a time, and get all people in your Sector to do likewise.
4. Do not enter a house without some evidence of your authority.
5. In emergency, report at your Post at once if you possibly can.
6. **KEEP CALM: DON'T PANIC:** many lives may depend on your actions and decisions in a raid. Lack of intelligence on your part may throw the highly organised A.R.P. services right out of gear.
7. Don't remain unnecessarily in the open during an actual raid.
8. Don't allow unauthorised persons to interfere with the various anti-air raid services and equipment.
9. **HELP YOUR SECTOR BEFORE YOU HELP INDIVIDUALS** if you must make a choice.
10. During a raid don't leave your Patrol except to make a Report to your Post, or unless authorised to do so by your Senior Warden.
11. Don't participate in the work of the other services when they arrive, unless specifically requested to do so.
12. Don't fail to report every untoward happening in your Sector
13. **Make your Reports quick, clear, brief and accurate.**
14. Make every Report to Headquarters, even if you have called out a nearby service.
15. **Take every possible precaution to avoid yourself becoming a casualty.** Remember that every casualty amongst trained workers has the double effect of reducing their number and of increasing the burden of those who remain.
16. Don't return home after an air raid until you have reported to your Post and left your equipment there.

WARDENS' SECTOR MAPS

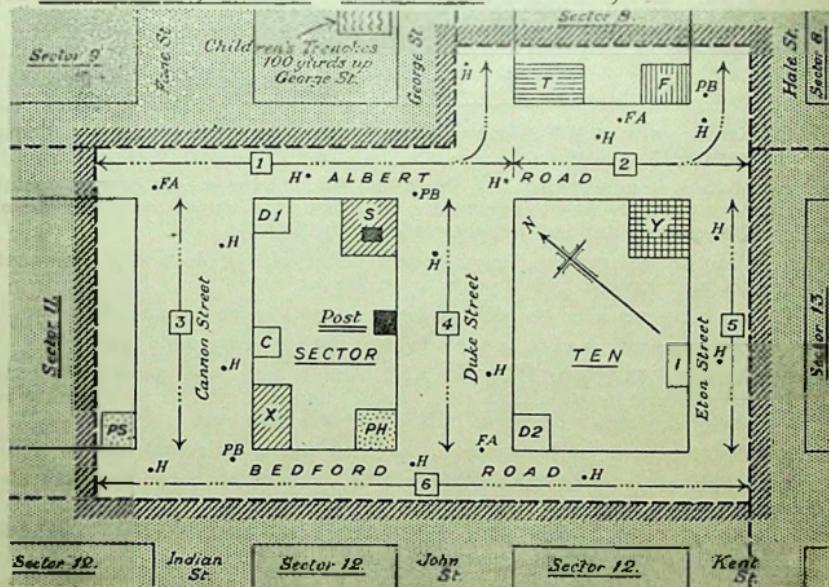
Every Senior Warden should prepare for the guidance of himself and of his Wardens an informative large sketch map of the Sector on the lines of the specimen illustrated.

The map need not be to scale. In fact, roadways should be exaggerated in width, so that the necessary information can be shown.

The Sector Maps should be **hung up in a conspicuous position in the Post**, and, if possible, a copy given to each Warden.

An alternative smaller Day-patrol Map can usefully be drawn up where the number of Wardens available during the day is less. This need not repeat all the details of the Sector map.

SECTOR MAP, POST 10. Senior Warden: James Harper, 11 Duke Street.



Coloured inks or paints can be used with advantage, especially to distinguish neighbouring Sectors and Posts, and make the actual Sector stand out clearly.

Insert on the Map:

- (1) Points of special danger, e.g., factories, garages, timber yards, schools and cinemas.
- (2) Places at which help is obtainable, e.g., First Aid Posts or Points, doctors, nurses, chemists, Fire Posts, places with hand fire-fighting equipment, Police Stations.
- (3) Fire hydrants, or other sources of water supply, e.g., ponds or rivers.
- (4) Points for despatch of messages, e.g., Public telephones, police phone boxes, private phones (where arranged) and fire alarms.
- (5) Public shelters, trenches, etc., or private shelters where accommodation might be found for pedestrians.
- (6) The position of the Post and Wardens' houses.
- (7) Any other special features which the Senior Warden and Wardens consider useful, e.g., points of danger, etc., just outside the Sector.

Attach to the Map concise additional useful particulars:

- (a) Addresses of all Wardens in the Sector.
- (b) In respect of a factory, its nature, prevalent dangers, number of work-people, hours open, whether A.R.P. organisation in the factory, and so on.
- (c) Addresses of old people, invalids, or others needing particular help.

- (d) Addresses and telephone numbers of the Post of the adjoining Sectors.
- (e) Names and addresses of Wardens in neighbouring Sectors whose patrols abut on to the Sector. These can be supplied by neighbouring Senior Wardens, and the Wardens concerned should get to know each other.
- (f) Addresses of people who have promised special help in an emergency, e.g., a car for A.R.P. use.

A copy of the Sector map can usefully be supplied to any large premises, factories, etc., which have their own internal Post.

SECTOR INFORMATION CHART

To accompany Sector Map.

- X. **Cinema**—Danger point—panic— evenings and afternoons Corner Cannon Street and Bedford Road.
- P.S. **Public Shelter**—Corner Cannon Street and Bedford Road. Attention needed here at warning.
- S. **School**—Corner Albert Road and Duke Street. Danger point during school hours—trenches for children provided 100 yards up George Street opposite.
- T. **Timber Yard**—Corner George Street and Albert Road—Fire Danger.
- F. **Factory**—Corner Hale Street and Albert Road—Chemical Works—grave danger of explosion.
- Y. **Garage**—Petrol Store—special fire danger Corner Eton Street and Albert Road.
- P.H. **Public House**—possible danger point during opening hours.
- D.1. **Doctor** Forbes, 2, Cannon Street.
- D.2. **Doctor** Sims, 26, Duke Street.
- C. **Chemist**, Mr. Robison, 16, Cannon Street.
- I. **First Aid Point**—Mrs. George, Member St. John, 29, Eton Street.
- H. **Fire Hydrants** : Albert Road, opposite No. 251, No. 269, corner Duke Street; No. 278, Factory corner Hale Street. Bedford Road, opposite Public Shelter, corner Cannon Street; No. 266, corner Duke Street; No. 276, Cannon Street, opposite No. 6; No. 18, Duke Street, opposite No. 5; No. 20, Eton Street, opposite side entrance of Garage on corner; No. 29, George Street, opposite side of Timber Yard on corner of Albert Road.
- F.A. **Fire Alarms**—Albert Road, opposite No. 235, corner Cannon Street : No. 280. Bedford Road, opposite Dr. Sims, corner Duke Street.
- P.B. **Police Boxes**—Cannon Street, corner Bedford Road, outside cinema. Albert Road, corner Duke Street, outside School, corner Hale Street

WARDENS' PATROLS

- | | | |
|-------------------------|---------------|--|
| 1. J. Jones. | ALBERT ROAD | S. side from 233 to Duke Street |
| 2. R. Brown. | ALBERT ROAD | N. side from George Street to Hale Street. |
| 3. T. Smith. | CANNON STREET | S. side from 269 to 291 inclusive. |
| 4. L. Black. | DUKE STREET | Both sides. |
| 5. M. White. | ETON STREET | W. side only from 1 to 33 inclusive. |
| 6. K. Davis. | BEDFORD ROAD | N. side only from 232 to Eton St. |
| 7. Mrs. F. Green | | will be stationed at the Post with Mr. Harper. |

For purposes of this illustration patrols have been allotted to six wardens, so it can be assumed that at least another six wardens are available in this Sector for relief. If only six wardens are available altogether, only three would patrol at a time, and each would patrol a longer stretch of road.

PRACTICAL TRAINING OF WARDENS¹

As the work of Air Raid Wardens during time of war is most vital to the adequate protection of the civilian population, they must not only keep up-to-date their knowledge of Air Raid Precautions, but must also obtain ample practical training.

From the date of their enrolment, therefore, all Wardens should be kept fully conversant with their duties and with **developments in the local A.R.P. Organisation**, and be given as much practical instruction as possible so that they can be trained to carry out their duties with speed, accuracy, coolness, and efficiency.

In emergency, a Warden who cannot get to his own Sector in time must offer his services at any Wardens' Post (in his own town or outside it). Hence, the work, reports, duties, and practical exercises of Wardens **throughout the country** must be arranged on the same clear-cut basis and on the same lines, subject to any modifications necessary to meet local conditions.

Practical instructions for Wardens' exercises in each Wardens' organisation should therefore be drafted, in general accordance with Home Office regulations, but with special reference to local arrangements, by the Chief Warden in consultation with his Divisional or Group Wardens.

The Home Office regulations² provide that the training of Wardens shall proceed by stages:

1. **INDIVIDUAL TRAINING**, to ensure their personal efficiency in all matters mentioned on page 76-77 of this booklet.
2. **COLLECTIVE TRAINING**. To ensure that Wardens can work efficiently together as a team they are required to be progressively trained in such matters as (a) the working of a Post, including distribution of respirators; patrols: action on receipt of air raid warning, etc.; (b) the reporting on official forms, by night and by day, of bombs, fires and air raid damage; (c) action in emergency (see page 83); (d) action after a raid is over, i.e., in controlling the public in the Sector, and reporting "All Clear".
3. **COMBINED EXERCISES** for teams of Wardens with teams from other branches of the A.R.P. services, so as to ensure their co-operation and co-ordination. The exercises are intended to be arranged progressively from simple practices to exercises wherein the whole A.R.P. organisation in a town is worked together under realistic conditions at night.
4. **REFRESHER COURSES**, to ensure that knowledge is up-to-date and efficiency maintained.

¹ See also the author's "Tactical Training in A.R.P."

² A.R.P. Memorandum No. 9.

The individual training is given by instructors drawn from each Group, and includes theoretical instruction on all Wardens' duties, illustrated where possible by models of local sectors, blackboard sketches, sand table demonstrations, lantern slides, cinema films, etc., together with practical instruction in respirator drill, report writing, and actual performance of duties both indoors and outdoors, in daylight and in darkness.

The collective training and combined exercises are arranged by a specially appointed Director with a staff embracing a Chief Umpire, Umpires and Producers, who will be jointly responsible for framing, staging and reporting on the exercises.

As is indicated by the following "Contents", complete guidance concerning the scope and arrangement of individual and collective training and of combined exercises, together with a large number of specimen Sector, Group, and Area Exercises with fully worked solutions, are given in the author's fully illustrated companion volume, "**Tactical Training in A.R.P.**" (obtainable direct from the author, "Rathcoole", Homewood Road, St. Albans, price 1s. 3d. post free).

Contents.—*Chapter 1*: The Warden's Place in the A.R.P. Organisation; *Chapter 2*: Scope of Warden's Training; *Chapter 3*: Scheme of Practical Training; *Chapter 4*: Functions of other A.R.P. Services; *Chapter 5*: The Report Centre; *Chapter 6*: Wardens' Relations with Police and Public; *Chapter 7*: Damage to Service Mains; *Chapter 8*: Practice in Report Writing; *Chapter 9*: Action in Reporting; *Chapter 10*: Action and Reports; Fire Incidents; *Chapter 11*: Action and Reports: Poison Gas Incidents; *Chapter 12*: Action and Reports: High Explosive Incidents; *Chapter 13*: Action and Reports: Complicated Incidents; *Chapter 14*: Outdoor Sector and Group Exercises; *Chapter 15*: Realistic Group Exercise (involving Trained Performers); *Chapter 16*: Collective Training of Specialist Services; *Chapter 17*: Arrangement of an Area Exercise; *Chapter 18*: Daytime A.R.P. Experiment; *Chapter 19*: Displays and Demonstrations.

Appendices.—Model Solutions to Exercises: (A) Report Writing; (B) Fire Incidents; (C) Gas Incidents; (D) High Explosive Incidents; (E) Complicated Incidents; (F) Suggested Solutions—Group Exercises.

SANDBAGS

REGULATION SIZE WITH
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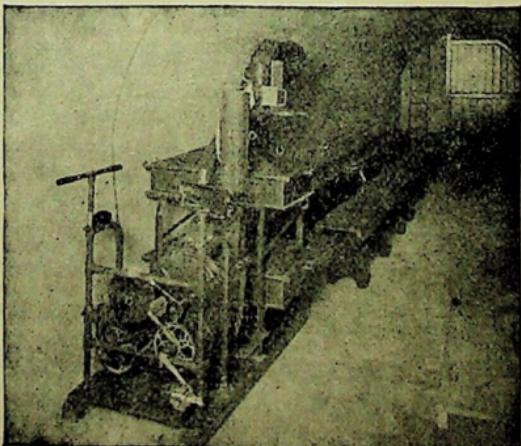
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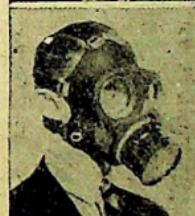
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